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SOIL SURVEY

Marion County Tennessee

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
TENNESSEE AGRICULTURAL EXPERIMENT STATION
TENNESSEE VALLEY AUTHORITY

How to Use THE SOIL SURVEY REPORT

THIS SURVEY of Marion County will help you plan the kind of farming that will protect your soils and provide good yields. It describes the soils; shows their location on a map; and tells what they will do under different kinds of management.

Find Your Farm on the Map

In using this survey, start with the soil map, which consists of the 43 sheets bound in the back of this report. These sheets, if laid together, make a large photographic map of the county. You can see woods, fields, roads, rivers, and many other landmarks on this map.

To find your farm on the large map, use the index to map sheets. This is a small map of the county on which numbered rectangles have been drawn to show where each sheet of the large map is located.

When you have found the map sheet for your farm, you will notice that boundaries of the soils have been outlined, and that there is a symbol for each kind of soil. All areas marked with the symbol are the same kind of soil, wherever they appear on the map.

Suppose you have found on your farm an area marked with the symbol Ba. You learn the name of the soil this symbol represents by looking at the map legend. The symbol Ba identifies Barbourville loam.

Learn About Soils on Your Farm

Barbourville loam and all the other soils mapped are described in the section, Soil Series, Types, and Phases. Soil scientists, as they walked over the fields and through the woodlands, described and mapped the soils; dug holes and examined surface soils and subsoils; measured slopes with a hand level; noted differences in growth of crops, woods, brush, or trees; and, in fact, recorded all the things about the soils that they believed might affect their suitability for farming.

After they mapped and studied the soils, the scientists talked with farmers and others about the use and management each soil should have, and then they placed each soil in a management group. A management group is a group of similar soils that need and respond to about the same kind of management.

Barbourville loam is in management group 2. Turn to the section, Use and Management of Soils, and read what is said about the soils of group 2. Study the table, which tells you how much you can expect to harvest from Barbourville loam under two levels of management. In columns A are yields to be expected under ordinary management, and in columns B are yields to be expected under improved management.

Make a Farm Plan

For the soils on your farm, compare yields and farm practices with those given in this report. Look at your fields for signs of runoff and erosion. Then decide whether or not you need to change your methods. The choice, of course, must be yours. This survey will aid in planning new methods, but it is not a plan of management for your farm or any other farm in the county.

If you find that you need help in farm planning, consult the local representative of the Soil Conservation Service or the county agricultural agent. Members of your State experiment staff and others familiar with farming in your county will also be glad to help you.

This publication of the soil survey of Marion County, Tenn., is a cooperative contribution from—

SOIL CONSERVATION SERVICE
TENNESSEE AGRICULTURAL EXPERIMENT STATION
TENNESSEE VALLEY AUTHORITY

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SOIL SURVEY OF MARION COUNTY, TENNESSEE

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United States Department of Agriculture in cooperation with the Tennessee Agricultural Experiment Station and the Tennessee Valley Authority

General Nature of the Area

MARION COUNTY is in the southern part of Tennessee. Most of the county is on the Cumberland Plateau, but it includes the valley of the Sequatchie River, Walden Ridge, and part of the valley of the Tennessee River. The climate is humid and temperate, and the growing season is fairly long. Much of the county is in cutover forest.

Location and Extent

Marion County occupies approximately 507 square miles, or 324,480 acres, in the south-central part of Tennessee (fig. 1). It is bounded on the west by Franklin County, on the north by Grundy and Sequatchie Counties, on the east by Hamilton County, and on the south by Alabama and Georgia. Jasper, the county seat, is 20 miles west of Chattanooga and 100 miles southeast of Nashville.

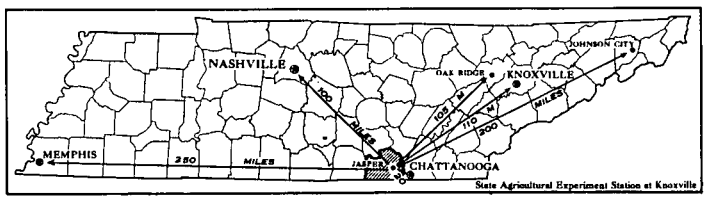

Figure 1.—Location of Marion County in Tennessee.

Physiography, Relief, and Drainage

Physiographically, most of Marion County is on the Cumberland Plateau, which is a part of the Appalachian Plateaus province. The Tennessee River cuts across the southeastern corner. The valley of the Sequatchie River crosses the county from the northeast to the south-central part. It is about 4 miles wide and about 20 miles long. It is underlain by sedimentary rocks that range in age from the basal Pennsylvanian to the Upper Ordovician.

Throughout its length the valley is almost perfectly straight. It is bounded by notched escarpments that have preserved their original alinement. The linear characteristics of the valley are accounted for by the uniform size of the anticlinal fold. Although elsewhere in the county, the rocks are practically horizontal, they once arched continuously in an anticlinal structure from the Cumberland Plateau to Walden Ridge. In the upper part of this arch, the rocks were eventually worn away until easily eroded limestone was exposed. As a result of long-continued erosion, the valley was formed.

The Cumberland Plateau, partly in this county, is a true peneplain. It has an undulating surface dissected by young valleys, which are deeper near the edge of the plateau. In the northwestern corner of the county, the plateau is undulating to gently rolling except near its edge, where deep gorges cut into the face of the escarpment. On Walden Ridge, however, the plateau is much more highly dissected and the elevation is more than 1,000 feet.

The Walden and Lookout sandstones of the Pennsylvanian cap the Cumberland Plateau throughout its extent in the county. The formations consist of massive crossbedded sandstone containing numerous quartz pebbles (*6, 7*). The valley of the Sequatchie River, in the eastern part of the county, occupies a lowland belt characterized by parallel low ridges and valleys that extend in a general northeast-southwest direction. The underlying rocks consist almost entirely of limestone, chiefly of the Ordovician period. The limestones vary considerably from place to place. The ridges are underlain by cherty dolomitic limestone, and the broader valleys are underlain by argillaceous limestones. Practically all of the clayey limestones, however, are covered by several feet of alluvial deposits. Only one band of shale occurs in the valley, and it is generally less than 200 feet wide.

The relief of the valley is prevailingly rolling to hilly, although it ranges from nearly level to steep (fig. 2). The valley floor is interrupted by erosional remnants of ridges.

The original drainage pattern is trellislike. The county is drained by the Tennessee and Sequatchie Rivers and their tributaries. There are a number of small streams, many of which are intermittent.

Climate

The climate of Marion County is humid and temperate. Summers are hot. Winters are moderate, but short erratic cold spells occur. The precipitation is well distributed over the county. Little of it falls as snow. Snowfalls are usually light, and the snow lasts for only a few days.

Table 1 gives normal monthly, seasonal, and annual temperatures and precipitation compiled from records kept at the United States Weather Bureau stations at Chattanooga and Sewanee in counties adjoining Marion County.

Data compiled at the Chattanooga station, in Hamilton County, are representative of conditions prevail-

[1] Fieldwork for this survey was done when Soil Survey was part of the Bureau of Plant Industry, Soils, and Agricultural Engineering. Soil Survey was transferred to the Soil Conservation Service on November 15, 1952.

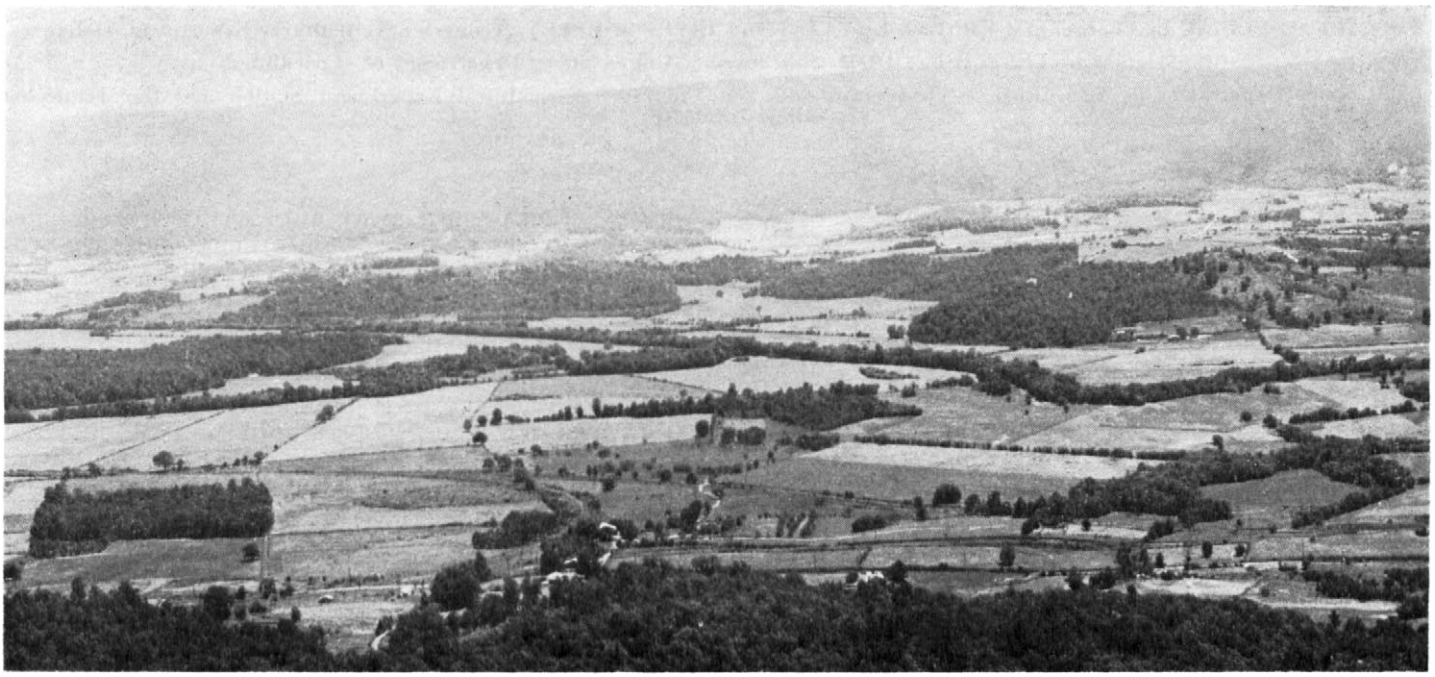

Figure 2.—**Cross section of Sequatchie Valley: Cumberland Plateau escarpment in background; wooded areas on valley floor are mainly cherty Fullerton and Clarksville soils surrounded by large areas of soils on smooth terraces.**

ing in the valley part of Marion County. Data compiled at the Sewanee station, on the Cumberland Plateau in Franklin County, are representative of conditions in the plateau areas of the county.

The average length of the growing season in the area covered by the Chattanooga records is 207 days. The average date of the last frost in spring is April 2, according to the Chattanooga records, and the average date of the first frost in autumn is October 26. Frosts have occurred in the Chattanooga area, however, as late as May 24 and as early as September 30.

According to records kept at the Sewanee station, the average date of the last frost in spring is April 12, and the earliest in fall is October 29. Frosts in the Sewanee area have occurred, however, as late in spring as May 10 and as early in fall as October 1.

Water Supply

Except for some areas of the Cumberland Plateau, the water supply in Marion County is adequate for domestic use and for livestock. The few head of livestock on the plateau obtain water from streams and springs or from the few wells or small ponds. In the valley, shallow wells and springs provide most of the water for farm homes in areas underlain by clayey limestone. Cisterns are a more common source of water for homes in areas underlain by cherty limestone.

The many perennial streams and springs provide most of the water for livestock in the valley, and during the winter and spring many intermittent streams carry enough water for the animals. Cisterns, tanks, and artificial ponds are used as supplemental sources.

Vegetation

Forests covered the county at the time the first white settlers arrived, and between 82 and 83 percent of the county, or about 268,300 acres, is still under forest. All the areas have been heavily cut over, and the wood used for crossties, or as lumber or firewood. The forests consist mainly of oaks and hickories, but small better drained areas have trees of a blackjack oak-hardwood type growing on them. Some poorly drained areas have bottom-land hardwoods[2].

Organization and Population

Cherokee Indians once held the territory that is now Marion County. In 1817 the county was formed from the Cherokee lands and was named for Gen. Francis Marion. The county was organized at Liberty, but in 1820 the capital was moved to Jasper (*2*).[3]

Most of the settlers came from North Carolina and Virginia, but a few came from other parts of the eastern seaboard. The settlers were mainly of English descent, but a few were of Scotch or Irish ancestry (*1*). The present population is largely descended from these early settlers.

According to the Federal census, the county had a population of 20,520 in 1950, most of which was rural. Jasper, the county seat, had a population of 1,198, and South Pittsburg, the largest town, had a population of 2,573. Most of the people live in the valley of the

[2] Forestry data supplied by G. B. Shivery, extension forester, University of Tennessee.

[3] Italic numbers in parentheses refer to Literature Cited, p. 88.

TABLE 1.—*Normal temperature and precipitation at two weather stations*

CHATTANOOGA AIRPORT STATION, HAMILTON COUNTY, TENN., ELEVATION, 670 FEET

Month	Temperature [1]			Precipitation [2]			
	Average	Absolute maximum	Absolute minimum	Average	Driest year	Wettest year	Average snowfall
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December	42.1	75	3	5.31	4.12	2.89	1.5
January	41.6	76	−7	5.23	2.58	5.72	2.5
February	44.0	79	−10	5.11	2.08	5.83	2.2
Winter	42.6	79	−10	15.65	8.78	14.44	6.2
March	50.7	89	2	6.05	5.81	10.80	.8
April	59.7	92	25	4.53	1.67	6.70	.2
May	67.7	95	37	4.16	2.76	12.00	0
Spring	59.4	95	2	14.74	10.24	29.50	1.0
June	75.8	100	39	4.21	1.92	4.39	0
July	78.3	104	56	5.34	2.09	3.21	0
August	77.3	101	54	3.70	5.03	.45	0
Summer	77.1	104	39	13.25	9.04	8.05	0
September	72.5	104	38	2.69	1.07	5.66	0
October	60.8	92	26	3.24	.46	3.12	[3]
November	49.1	81	11	4.03	3.09	11.60	.3
Fall	60.8	104	11	9.96	4.62	20.38	.3
Year	60.0	104	−10	53.60	[4] 32.68	[5] 72.37	7.5
SEWANEE STATION, FRANKLIN COUNTY, TENN., ELEVATION, 1,910 FEET							
December	39.9	71	−6	5.33	4.32	3.03	1.7
January	38.9	70	−7	5.43	4.64	7.44	3.2
February	40.0	74	−11	5.27	1.24	5.86	2.4
Winter	39.6	74	−11	16.03	10.20	16.33	7.3
March	48.5	86	4	6.20	3.98	9.52	1.4
April	56.7	90	20	4.94	4.44	5.99	.3
May	65.4	90	30	4.40	.77	11.35	0
Spring	56.9	90	4	15.54	9.19	26.86	1.7
June	72.8	99	39	4.64	2.66	6.87	0
July	75.6	103	51	5.63	4.45	3.23	0
August	74.9	101	51	4.38	4.95	.93	0
Summer	74.4	103	39	14.65	12.06	11.03	0
September	70.3	101	34	3.15	.60	9.69	0
October	59.8	90	21	3.21	3.58	4.86	.1
November	48.0	78	3	4.61	3.10	8.40	.5
Fall	59.4	101	3	10.97	7.28	22.95	.6
Year	57.6	103	−11	57.19	[6] 38.73	[5] 77.17	9.6

[1] *Chattanooga:* Average temperature based on an 18-year record, through 1955; highest and lowest temperatures on a 52-year record, through 1930. *Sewanee:* Average temperature based on a 49-year record, through 1942; highest and lowest temperatures on a 35-year record, through 1930.

[2] *Chattanooga:* Average precipitation based on a 77-year record, through 1955; wettest and driest years based on a 77-year record, in the period 1879-1955; snowfall, based on a 52-year record, through 1930. *Sewanee:* Average precipitation based on a 62-year record, through 1955; wettest and driest years based on a 56-year record, in the period 1860-1955; snowfall, based on a 33-year record, through 1930.

[3] Trace. [4] In 1904. [5] In 1929. [6] In 1941.

Sequatchie River. The Cumberland Plateau is sparsely settled.

Transportation and Markets

Practically all parts of the valley of the Sequatchie River have hard-surfaced highways. Jasper is on State Highway no. 27 and on Federal Highways 41, 64, and 72. South Pittsburg is on Federal Highway 72. Both towns are also on a branch line of the Nashville, Chattanooga and St. Louis Railroad.

Most of the farm products not used locally are shipped or hauled by truck to Chattanooga or Nashville. Much of the coal is shipped by rail, but some is hauled by truck to nearby towns, and a large quantity is moved by barges on the Tennessee River.

In 1950, according to the Federal census, 350 farms were located 0.2 mile or less from an all-weather road, and 75 farms were at least 5 miles from the nearest all-weather road.

Many parts of the Cumberland Plateau are practically inaccessible to automobiles. Two hard-surfaced roads cross the plateau, and there are a few gravel roads. Most of the farms 5 miles or more from an all-weather road were on the plateau.

Agriculture

About 26.5 percent of Marion County, or 86,015 acres, was in farms in 1950. The farms are generally small, and crops are diversified. On many farms the crops are grown mainly for home use. Dairying and the raising of beef cattle have increased. As the number of cattle has increased, better permanent pastures have been established.

The types and sizes of farms, land use, crops, livestock and livestock products, and other subjects related to agriculture are discussed in the following subsections.

Land Use

The approximate area of Marion County is 324,480 acres. According to the 1950 Federal census, 86,015 acres, or about 26.5 percent, was land in farms. Of the 964 farms that reported, about 45 acres on each farm was improved.

The acreage of land in farms is given below, according to use.

	Acres in 1949
All cropland	43,750
Harvested	25,075
Used only for pasture	13,001
Not harvested and not pastured	5,674
All woodland	37,656
Pastured	11,063
Not pastured	26,593
All other land pastured	1,551
Wasteland and all other land in farms not cropped, pastured, or in woodland	3,058

Large holdings of forest lands are controlled by individuals or corporations for future mining and lumbering purposes.

Types and Sizes of Farms

Of the 1,044 farms in Marion County, reported by the 1950 Federal census, 726 were miscellaneous and unclassified. The remaining farms were listed by type of farm as follows:

Livestock farms other than dairy and poultry	138
General farms	60
Field-crop farms other than fruit and nut	60
Dairy farms	35
Poultry farms	20
Fruit and nut farms	5

The size of the average farm was 82.4 acres. Farms in the county, however, range in size from under 10 acres to more than 1,000 acres.

Crops

Acreages of the principal crops in the county are shown in table 2 for stated years. On most farms in the county, crops are grown mainly for home use. Feed and food crops, chiefly corn, oats, wheat, lespedeza, red clover, and alfalfa, are grown on most farms, but corn is by far the most important crop grown for feed and food. (The 1954 Census of Agriculture has been published since this report was written. It shows that the acreage of corn harvested for grain has continued to decrease, although corn is still the leading crop. The acres in hay decreased from 7,641 in 1949 to 5,506 in 1954. Wheat is of minor importance in the county compared to corn and hay, but the number of acres of wheat threshed increased considerably from 1949 to 1954. The acreage in cotton decreased sharply.)

Small grains are used mainly as feed for livestock, but some wheat is used for food. The small grains are also used for winter cover and for winter pasture. Corn and hay are sold locally, but mostly they are fed to livestock on the farm. Burley tobacco and cotton, grown on only a small acreage, are the only strictly cash crops, but a substantial acreage of soybeans is grown for sale. Fruits, berries, Irish potatoes, sweetpotatoes, and many kinds of vegetables are grown for home use on most farms.

TABLE 2.—*Acreage of principal crops in stated years*

Crop	1929	1939	1949
	Acres	*Acres*	*Acres*
Corn harvested for grain	12,863	14,137	10,371
Small grain threshed:			
Oats	19	367	956
Wheat	161	1,441	294
Rye	(1)	64	53
Barley	(1)	292	170
Cowpeas for all purposes, grown alone	493	353	31
Soybeans for all purposes, grown alone	1,059	1,348	2,538
Hay	5,001	10,419	7,641
Timothy or timothy and clover mixed	414	521	429
Clover alone	181	149	(1)
Alfalfa	167	425	662
Other cultivated grasses	2,353	1,103	495
Wild grasses	217	667	(1)
Grains cut green	95	304	335
Legumes cut for hay	1,574	1,505	509
Lespedeza	(1)	5,745	5,211
Potatoes	325	520	[2] 223
Sweetpotatoes	242	297	[2] 49
Tobacco	52	58	39
Cotton	1,416	691	1,088

[1] No record.
[2] Excludes acres for farms with less than 15 bushels harvested.

Cropping Practices

Cropping practices vary greatly within the county, depending on differences in soil types, pattern of soil distribution, lay of the land, and size of farms. On the better soils of the valley, much of the tilling and harvesting is done with modern machinery. Small combines are generally used to harvest the small grains, but corn is harvested by hand. Potatoes and cotton are handpicked, as the small acreage on most farms does not justify the use of expensive machinery. There were 32 pickup hay balers in the county in 1950, according to the Federal census, and hay loaders are common. Grain binders for harvesting small grains are common in the hilly and steep parts of the valley. On the Cumberland Plateau most of the farmwork is done by using horse-drawn implements or by hand labor.

Small grains such as wheat, oats, barley, and rye are planted in the fall and are usually harvested in June. Crimson clover is generally turned under for green manure, but when grown for seed it is harvested in June and July. Soybeans are grown extensively on the imperfectly to poorly drained soils and are planted between April and July. Some buckwheat is grown, particularly on the heavier soils of the coves; it is planted during the latter part of July and in August. Buckwheat usually follows wheat and is harvested the latter part of October. Grasses and legumes are sown either in fall or in spring. Corn is usually planted in April or May, and cotton early in May.

Many different crops are grown, but many farmers do not rotate crops systematically. Many farmers use a rotation of corn, crimson clover, corn, and wheat followed by lespedeza. Another common rotation is lespedeza for 2 years, followed by corn or cotton.

The use of lime and commercial fertilizers has increased during recent years. Fertilizers such as 10-4-4[4], 4-12-4, 2-12-6, and 4-8-8, 20-percent superphosphate, 47-percent triple superphosphate, and basic slag are the most common fertilizing materials. They are used on all the field crops, but most extensively on corn, tobacco, and truck crops. Phosphatic fertilizers and lime are commonly used on pastures and on hay crops.

Pastures

Almost all farms have some fields classed as plowable pasture. The average size on each farm is small,

[4] Percentages, respectively, of nitrogen, phosphate, and potash.

or about 10 acres of plowable pasture. The quality is generally low. Many pastures are on soils not well suited to crops.

Pasture plants include lespedeza, Ladino clover and other white clovers, hop clovers, redtop, timothy, bermudagrass, orchardgrass, ryegrass, and bluegrass. Most of the pastures, however, consist mainly of lespedeza, or lespedeza mixed with one or more of the clovers or grasses mentioned. In many pastures broomsedge and native wild grasses are more plentiful than the other pasture plants. On the whole, pasture management has not been very good, but many farmers are beginning to improve their pastures by using fertilizers, seeding desirable legumes and grasses, controlling weeds, and controlling grazing.

Livestock and Livestock Products

According to the Federal census, 193 farms in Marion County listed livestock or livestock products as a major source of income in 1950. Table 3 gives the number of livestock on farms in the county in stated years. (The Census of 1954 shows that the number of cattle and calves increased to 8,414 and the number of chickens to 49,939. All other livestock decreased in numbers.)

Except on livestock farms, the livestock and livestock products are largely used on the farm; consequently, the number of animals on each farm is small. Most farmers keep one or two dairy cows and enough hogs and chickens to meet home needs. Nearly all the sheep, however, and most of the beef animals and some of the hogs and chickens are kept to provide cash income.

TABLE 3.—*Number of livestock on farms in stated years*

Livestock	1930	1940	1950
Horses and colts	[1] 604	[1] 471	[2] 624
Mules and mule colts	[1] 1,333	[1] 1,090	864
Cattle and calves	5,472	[1] 5,325	7,208
Sheep and lambs	613	[3] 1,013	294
Hogs and pigs	4,868	[4] 3,659	6,303
Chickens	[1] 36,798	[4] 36,992	[4] 38,700

[1] Over 3 months old.
[2] Including ponies.
[3] Over 6 months old.
[4] Over 4 months old.

The Soils of Marion County

Most of the soils of Marion County are well drained. The poorly drained soils occupy small areas and cover only a small total acreage. The somewhat poorly drained and moderately well drained soils are more common but are not extensive. Most of the county is rolling to steep, but relief ranges from nearly level to very steep. The degree of erosion varies greatly. Many of the soils are uneroded or only slightly eroded; some are moderately eroded; and others are severely eroded. Some of the soils contain loose fragments of chert, cobblestones, or stones that interfere with cultivation.

Many soils of the uplands and high stream terraces have been severely leached; consequently, they are acid and rather low in fertility and organic matter. They differ from one another in natural fertility and in content of organic matter, and such differences have been further widened by cropping and erosion. In contrast to the soils of the uplands and high stream terraces, many of the soils of the bottom lands and low stream terraces are only slightly acid, moderately high in natural fertility, moderately well supplied with bases, and fairly well supplied with organic matter.

The soils differ from one another in their use suitabilities. Some are highly productive, easy to work, and easy to conserve and therefore are well suited to agriculture. Others are low in productivity and difficult to work and conserve; they are unsuited to or very poorly suited to farming. Most of the soils, however, are between these two extremes. About 49 percent of the county is considered suitable for cultivation, 21 percent suitable for permanent pasture but not for cultivation, and 30 percent suitable only for forest.

Soil Series and Their Relations

To make full use of this soil survey, it is necessary to know the soils and to understand how they are related to one another. On the basis of differences in their characteristics, the soils of Marion County have been classified into soil series and several miscellaneous land types.

The relationship of the soils is more easily understood if they are grouped according to their position on the landscape. Table 4 groups the soil series according to position and shows parent material and predominant drainage for each. The soils, grouped according to their position on the landscape, are: Soils of the uplands; soils of the stream terraces; soils of the colluvial lands; and soils of the bottom lands. Each of these groups is discussed in the following subsections.

Soils of the uplands

The soils of the uplands occupy the higher lands above the stream valleys. They have developed from residuum formed through weathering of the underlying sedimentary rocks. The properties of the soils are generally closely related to the kind of underlying rock from which the parent materials originated. Two major classes of rock—limestone and sandstone—occur in Marion County. Limestone underlies practically all of the soils in the valley, and sandstone underlies the soils of the Cumberland Plateau.

Bolton series.—The deep, very friable Bolton soils were derived from high-grade dolomitic limestone containing a small amount of sand. They have dark-brown surface layers and red subsoils. These soils normally occur on southeast-facing slopes of rather high ridges that are occupied, in part, by Fullerton and Clarksville soils.

Fullerton and Clarksville series.—The Fullerton and Clarksville soils occupy most of the steep ridges that run through the center of the valley. The soils have developed from cherty dolomitic limestone. Many chert fragments occur on the surface and throughout the profile.

The Clarksville soils are more cherty than the Fullerton. They have light brownish-gray to grayish-brown surface layers and yellowish-brown or brownish-yellow subsoils. The Fullerton soils have pale-brown surface layers and yellowish-red or red subsoils.

Colbert and Talbott series.—The Colbert and Talbott soils are shallow, very plastic soils derived from clayey limestone. In Marion County these soils occur in small spots where the alluvial deposit has been removed by erosion.

The Colbert soils are shallow, more plastic, lighter colored, and have less distinct horizons than the Talbott soils. They have grayish-brown surface layers and brownish-yellow very plastic subsoils. The Tal-

TABLE 4.—*Soil series arranged by topographic position, parent material, and drainage*

SOILS OF THE UPLANDS

Parent materials or parent rcok	Excessively drained [1]	Well drained [2]	Moderately well drained [3]	Imperfectly drained [4]	Poorly drained [5]
Sedimentary rocks:					
High-grade limestone		Bolton			
Cherty limestone	Clarksville	Fullerton [6]			
Argillaceous limestone		Talbott [7]	Colbert [8]		
Interbedded limestone and shale	Armuchee [6]				
Acid sandstone	Muskingum	Hartsells			
		Linker			
		Crossville [7]			

SOILS OF THE TERRACES

Old general alluvium (stream terraces):					
Chiefly limestone		Cumberland	Wolftever [7]	Taft	Robertsville
		Etowah	Capshaw		
Chiefly sandstone, some limestone		Sequatchie	Whitwell [8]		

SOILS OF THE COLLUVIAL LANDS

Local alluvium (local wash and some colluvial material):					
Chiefly argillaceous and high-grade limestone		Hermitage			
Argillaceous limestone			Hollywood		
			Swaim		
Chiefly high-grade limestone		Emory [9]			
Cherty limestone		Minvale	Pace		
			Greendale [7]		
Chiefly acid sandstone		Allen [6]		Cotaco [9 10] and Atkins	
		Jefferson			
		Barbourville			

SOILS OF THE BOTTOM LANDS

Alluvium (stream bottoms):					
Chiefly limestone, some sandstone		Huntington		Lindside [9]	Melvin.
Mixed sandstone, shale, and limestone	Bruno [11]	Staser [7]		Hamblen [9]	Prader [12].

[1] Indistinct profile caused by rapid geological erosion; surface runoff rapid to very rapid; internal drainage slow to very rapid; color varies with parent material.

[2] Brown to reddish-brown or yellowish-brown soils, free of mottling to a depth of about 30 inches.

[3] Yellowish-brown to brownish-yellow soils, mottled below 18 to 24 inches.

[4] Pale-yellow soils—alluvial soils grayish-brown or yellowish-gray—mottled below 12 to 18 inches.

[5] Brownish-gray soils, mottled below 6 to 8 inches, and light-gray soils.

[6] Excessively drained to well drained.

[7] Well drained to moderately well drained.

[8] Moderately well drained to imperfectly drained.

[9] These soils do not have distinct textural horizons chiefly because of the short time their parent materials have been in place.

[10] Moderately well drained to poorly drained.

[11] Excessive drainage due to permeability rather than slope.

[12] Imperfectly drained to poorly drained.

bott soils have grayish-brown to brown surface layers and yellowish-red to reddish-yellow plastic subsoils. Bedrock outcrops are common on both soils, but are generally more numerous on the Colbert soils.

Armuchee series.—Soils of the Armuchee series are shallow. They have developed from the weathered products of interbedded limestone and calcareous shale. Shale and flat limestone fragments are commonly scattered over the surface. The surface layer is a light brownish-gray silty clay loam that immediately overlies bedrock. The depth of this soil is generally about 10 to 15 inches. The soil is not extensive and occurs in only one narrow strip that runs the entire length of the valley.

Hartsells, Linker, Crossville, and Muskingum series.—The soils of the Hartsells, Linker, Crossville, and Muskingum series have formed from residual sandstone. These coarse-textured soils occupy most of the Cumberland Plateau.

The Hartsells soils have light yellowish-brown or yellowish-brown surface layers and brownish-yellow friable subsoils. The Linker soils have light yellowish-brown or yellowish-brown surface layers and yellowish-red friable subsoils. The soils of both these series are rather shallow, and sandstone bedrock generally occurs at depths of 3 or 4 feet.

The Crossville soil has a dark-brown surface layer and a yellowish-brown friable subsoil. It is also shallow, as in most places the sandstone bedrock occurs at a depth of about 20 inches.

The Muskingum soils occupy the steeper slopes in association with the Hartsells, Linker, and Crossville soils. They are much shallower than the associated soils. They have many loose stones throughout the profile, and outcrops of sandstone bedrock are common. The Muskingum soils have light yellowish-brown surface layers and brownish-yellow or yellow subsoils.

Miscellaneous land types.—Areas of land that have no true soil because of mutilation by man or because of large amounts of bedrock outcrops, are called miscellaneous land types. Six of these land types occur in the uplands of Marion County. The names of the miscellaneous land types indicate their character and main differences. They are as follows: Bouldery colluvium, Allen soil material; Cobbly alluvium, Staser and Sequatchie soil materials; Gullied land, limestone soil materials; Rockland, limestone; Rockland, sandstone; and Stony hilly and rolling land, limestone.

Soils of the terrace lands

In the geologic past, the present rivers and streams flowed at considerably higher levels. At these higher levels they deposited gravel, sand, silt, and clay on their flood plains. As the streams cut into the land over the years and channels were gradually deepened, new flood plains were formed at lower levels. The old higher lying flood plains remained. These older areas, called terrace lands, are now above the overflow stage of the present streams. The soils in these areas have formed from old general stream alluvium. They are frequently referred to as second bottoms, or benches.

In Marion County soils of the terrace lands belong to the Cumberland, Etowah, Capshaw, Taft, Robertsville, Waynesboro, Wolftever, Sequatchie, and Whitwell series. The soils differ in color, texture, consistence, and drainage, and in kind of parent material.

Cumberland, Etowah, Capshaw, Taft, Robertsville, and Wolftever series.—These soils were derived from old mixed alluvium that consists mainly of limestone materials. Differences among the soils result from differences in age and in drainage.

The well-drained Cumberland and Etowah soils are similar except for differences in color. The Cumberland soils have dark-brown or dark reddish-brown surface layers and dark-red subsoils; the Etowah have brown surface layers and yellowish-red subsoils. The moderately well drained Capshaw soils have brown surface layers and strong-brown to yellowish-brown subsoils. The imperfectly drained Taft soil has a brownish-gray or light-gray surface layer and a brownish-yellow or pale-yellow subsoil splotched with gray. The poorly drained Robertsville soil is predominantly gray throughout, and the moderately well drained Wolftever soil has a grayish-brown surface layer and a brownish-yellow subsoil. The Wolftever soil occupies second bottoms or low terraces.

Waynesboro, Sequatchie, and Whitwell series.—The Waynesboro, Sequatchie, and Whitwell soils were derived from mixed alluvium that consists mainly of sandstone and shale but generally contains some materials from limestone. These soils are generally coarser textured than the other soils of the terraces, and the better drained members have a lighter colored surface layer.

The Waynesboro soils occupy old high stream terraces. They have light-brown to brown surface layers and red or yellowish-red subsoils. The soils of this series further differ from the Etowah and Cumberland in having a thick transition layer between the surface layer and the subsoil.

The Sequatchie and Whitwell soils occur on low stream terraces. The Sequatchie are well-drained brown soils. The Whitwell soil is imperfectly drained to moderately well drained; it is yellowish brown or brownish yellow and is mottled at depths below about 18 inches.

Soils of the colluvial lands

The soils of the colluvial lands occupy sloping fans and benches at the bases of slopes, particularly the longer and steeper slopes. They were derived from soil materials and rock fragments that have washed or rolled from the adjacent slopes. These soils occur along inextensive drainageways; at the bases of upland slopes; and on small sloping alluvial-colluvial fans where small streams have deposited material on the broad flood plains of larger streams.

Hermitage, Swaim, Emory, Hollywood, Pace, Minvale, and Greendale series.—In Marion County the soils of the colluvial lands that have washed from areas underlain by limestone are members of the Hermitage, Swaim, Emory, Hollywood, Pace, Minvale, and Greendale series. The soils differ in age and in horizon differentiation.

The Hermitage soils occur on old alluvial-colluvial deposits washed chiefly from high-grade limestone. They have brown surface layers and yellowish-red moderately friable subsoils.

The Swaim soils occupy a position similar to that occupied by the Hermitage soils, but they are derived from more clayey limestone materials. The Swaim soils have brown to yellowish-brown surface layers and reddish-brown or yellowish-red very plastic subsoils.

The Emory soil is well drained and predominantly brown throughout. Its parent materials are similar to those from which the Hermitage soils were derived.

The Hollywood soil is younger than the Swaim soils and its profile is darker colored.

The Pace soils were derived from old alluvial-colluvial deposits, chiefly from cherty limestone. Their surface layers are light yellowish brown or light brownish gray, and their subsoils are brownish yellow or yellowish brown. The Minvale soils have the same parent materials and occupy similar positions to the Pace soils but they differ by being better drained.

The Minvale soils have pale-brown surface soils and brownish-yellow to yellowish-red subsoils. The parent material of the Greendale soils is similar to that of the Minvale soils, but the Greendale soils are much younger and have less distinct horizons. They have grayish-brown to light yellowish-brown surface layers and yellowish-brown to light yellowish-brown subsoils.

Allen, Jefferson, Barbourville, Cotaco and Atkins series, and Bouldery colluvium, Allen soil material.—The Allen and Jefferson soils have formed in old alluvial-colluvial deposits washed from uplands underlain by acid sandstone. The Allen soils generally have reddish subsoils, but the subsoils of the Jefferson soils are generally brownish yellow.

The Barbourville and Cotaco and Atkins soils have developed from more recent alluvial-colluvial deposits washed from acid sandstone. They do not have the distinct surface layers and subsoils typical of the Allen and Jefferson soils. The Barbourville soils are well drained. They are brownish in color. The Cotaco and Atkins soils have not been mapped separately in this county, but the typical Cotaco profile is yellowish brown or pale brown in the upper part, and light gray or brownish gray in the lower part. The typical Atkins profile is more grayish than that of the Barbourville soils.

One land type, Bouldery colluvium, Allen soil material, is mapped on the colluvial lands.

Soils of the bottom lands

Bottom lands are the flood plains or nearly level areas along streams that are sometimes flooded. The materials from which the soils of the bottom lands are developing have been deposited by the streams. The nature of the soil materials depends largely upon the source from which they originated in the higher lying lands and upon the rate the water was moving when the material was deposited. The soils of the bottom lands are young. The material from which they are developing has not been in place long enough for well-defined surface layers and subsoils to have developed, such as have developed in most of the soils of the uplands and terraces. In Marion County the soils of the bottom lands are those of the Huntington, Lindside, Melvin, Bruno, Staser, Hamblen, and Prader series.

Huntington, Lindside, and Melvin series.—The Huntington, Lindside, and Melvin soils are derived from recent alluvium washed mainly from uplands underlain by limestone. The differences in these soils are caused chiefly by differences in drainage.

The Huntington soils are brown or grayish-brown well-drained soils. The imperfectly drained Lindside soil is brown or grayish brown and is highly mottled at depths below about 12 to 18 inches. The Melvin soil is poorly drained and is generally gray throughout.

Bruno, Staser, Hamblen, and Prader series.—The Bruno, Staser, Hamblen, and Prader soils are derived from recent alluvium washed from uplands underlain predominantly by sandstone. They differ from one another chiefly because of differences in drainage. The excessively drained Bruno soil is yellowish brown and extremely sandy. The well-drained Staser soils are yellowish brown to brown. The imperfectly drained Hamblen soil is yellowish brown and is highly mottled below depths of 12 to 18 inches. The Prader soil is poorly drained and is dark yellowish brown to olive gray or light gray.

Soil Series, Types, and Phases

In the following pages the soils of Marion County and their relation to agriculture are discussed in detail. The acreage and proportionate extent of the mapping units are listed in table 5, and the location and distribution of the soils are shown on the map at the back of this report.

Allen fine sandy loam, eroded rolling phase (5 to 12 percent slopes) (Ab).—This deep, well-drained soil of the old colluvial lands has a light-colored surface soil and a red friable subsoil. The parent material has washed largely from uplands underlain by sandstone, but it includes some material from limestone. The materials came mainly from the Cumberland tableland and were deposited at the base of its steep escarpment and spread out a short distance over the valley. Practically all areas are underlain by limestone at depths of 3 feet or more. The areas are medium to small. The soil is closely associated with the Barbourville and Sequatchie soils and with other Allen soils. It has developed largely under deciduous forest.

Profile description:

0 to 8 inches, light brownish-gray to light yellowish-brown or grayish-brown very friable fine sandy loam.
8 to 14 inches, mingled yellowish-red and light yellowish-brown friable clay loam; when crushed, reddish yellow or strong brown; weakly developed fine blocky structure.
14 to 27 inches, yellowish-red friable fine sandy clay or clay loam; moderately developed medium to fine blocky structure; contains many small partly decomposed sandstone fragments.
27 to 43 inches, red friable very fine sandy clay; moderately developed medium blocky structure.

Chiefly because of erosion, the surface layer ranges from about 4 to 8 inches in thickness. Where tillage

TABLE 5.—*Approximate acreage and proportionate extent of the soils*

Soils	Area	Extent
	Acres	*Percent*
Allen fine sandy loam:		
Eroded rolling phase	524	0.2
Eroded hilly phase	238	.1
Allen clay loam, severely eroded hilly phase	533	.2
Allen stony fine sandy loam:		
Eroded rolling phase	268	.1
Hilly phase	1,310	.4
Eroded hilly phase	1,801	.6
Armuchee silty clay loam:		
Hilly phase	300	.1
Steep phase	509	.2
Barbourville loam	2,036	.6
Barbourville stony fine sandy loam	147	(1)
Bolton silt loam:		
Eroded rolling phase	170	.1
Hilly phase	105	(1)
Eroded hilly phase	384	.1
Bolton silty clay loam, severely eroded hilly phase	194	.1
Bouldery colluvium, Allen soil material	61,412	18.9
Bruno loamy fine sand	214	.1
Capshaw silt loam:		
Undulating phase	270	.1
Eroded undulating phase	1,780	.5
Eroded rolling phase	92	(1)
Clarksville cherty silt loam:		
Steep phase	2,073	.6
Hilly phase	173	.1
Rolling phase	142	(1)
Cobbly alluvium, Staser and Sequatchie soil materials	3,704	1.1
Colbert silty clay loam, eroded rolling phase	119	(1)
Cataco and Atkins silt loams	3,195	1.0
Crossville loam, rolling phase	203	.1
Cumberland silty clay loam:		
Eroded undulating phase	366	.1
Eroded rolling phase	774	.2
Eroded hilly phase	424	.1
Severely eroded hilly phase	683	.2
Emory silt loam	2,138	.7
Etowah silty clay loam:		
Eroded undulating phase	1,946	.6
Eroded rolling phase	1,204	4
Severely eroded rolling phase	339	.1
Eroded hilly phase	175	.1
Severely eroded hilly phase	297	.1
Fullerton silt loam:		
Hilly phase	289	.1
Eroded hilly phase	405	.1
Eroded rolling phase	258	.1
Fullerton cherty silt loam:		
Hilly phase	3,050	.9
Eroded hilly phase	1,498	.5
Fullerton cherty silty clay loam, severely eroded hilly phase	536	.2
Fullerton cherty silt loam:		
Steep phase	1,038	.3
Eroded steep phase	671	.2
Rolling phase	564	.2
Eroded rolling phase	657	.2
Greendale silt loam	832	.3
Greendale cherty silt loam	297	.1
Gullied land, limestone soil materials	286	.1
Hamblen loam	2,063	.6
Hartsells fine sandy loam:		
Undulating phase	7,128	2.2
Eroded undulating phase	1,073	.3
Rolling phase	52,465	16.3
Eroded rolling phase	2,084	.6
Hermitage silt loam:		
Eroded undulating phase	221	.1
Eroded rolling phase	263	0.1
Hollywood silty clay loam	339	.1
Huntington silt loam	1,821	.6
Huntington loam	1,291	.4
Huntington fine sandy loam	697	.2
Jefferson fine sandy loam:		
Rolling phase	4,956	1.5
Eroded rolling phase	925	.3
Lindside silt loam	2,946	.9
Linker loam:		
Rolling phase	1,764	.5
Eroded rolling phase	233	.1
Melvin silty clay loam	2,640	.8
Minvale cherty silt loam, eroded rolling phase	485	.2
Minvale silt loam:		
Eroded undulating phase	116	(1)
Eroded rolling phase	499	.2
Muskingum stony fine sandy loam:		
Steep phase	26,715	8.2
Hilly phase	39,380	12.1
Rolling phase	489	.2
Pace silt loam, eroded undulating phase	392	.1
Pace cherty silt loam:		
Eroded rolling phase	482	.2
Eroded hilly phase	186	.1
Prader silt loam	2,451	.8
Robertsville silt loam	440	.1
Rockland, limestone	22,761	7.0
Rockland, sandstone	20,917	6.4
Sequatchie loam:		
Undulating phase	3,052	.9
Eroded undulating phase	4,395	1.4
Eroded rolling phase	728	.2
Sequatchie fine sandy loam:		
Undulating phase	1,049	.3
Eroded undulating phase	357	.1
Sequatchie cobbly fine sandy loam:		
Undulating phase	1,730	.5
Eroded undulating phase	784	.2
Eroded rolling phase	233	.1
Staser loam	2,263	.7
Staser fine sandy loam	1,422	.4
Staser cobbly fine sandy loam	215	.1
Stony hilly and rolling land, limestone	786	.2
Swaim silty clay, severely eroded rolling phase	426	.1
Swaim silty clay loam, eroded undulating phase	126	(1)
Taft silt loam	976	.3
Talbott and Colbert silty clay loams, eroded undulating phases	61	(1)
Talbott silty clay loam, eroded rolling phase	301	.1
Talbott silty clay, severely eroded rolling phase	132	(1)
Waynesboro loam:		
Eroded undulating phase	188	.1
Eroded rolling phase	666	.2
Waynesboro clay loam, severely eroded rolling phase	203	.1
Waynesboro loam:		
Hilly phase	154	(1)
Eroded hilly phase	285	.1
Waynesboro clay loam, severely eroded hilly phase	904	.3
Waynesboro cobbly fine sandy loam:		
Rolling phase	125	(1)
Eroded rolling phase	142	(1)
Hilly phase	219	.1
Eroded hilly phase	129	(1)
Whitwell loam	1,941	.6
Wolftever silt loam, undulating phase	1,643	.5
Total land acreage	324,480	100.0

[1] Less than 0.1 percent.

has mixed the original surface layer with subsoil material, the present surface layer is a clay loam or very fine sandy clay loam. There are a few small angular sandstone fragments in all areas, but they do not interfere with cultivation.

The soil is medium to strongly acid and medium to low in fertility. It allows extensive penetration of plant roots and normal circulation of air and moisture. It is easy to work, moderately easy to conserve, and moderate in water-supplying capacity.

Use suitability.—Practically all of this soil is now used for corn, small grains, hay, pasture, and, to some extent, for truck crops. A sizeable acreage is idle or in unimproved pasture.

The soil is well suited to all crops commonly grown. It does not have enough lime, phosphorus, potassium, and nitrogen to produce high yields of most crops. Much of the original surface soil has been lost through erosion. With progressive loss of surface soil, the soil has become less fertile, slightly more droughty, and more susceptible to further erosion. If the soil is properly fertilized and otherwise well managed, high yields are possible. This soil is in management group 9.

Allen fine sandy loam, eroded hilly phase (12 to 25 percent slopes) (Ac).—This is a well-drained, deep, friable soil of the old colluvial lands. It has a light-colored surface soil and red, friable subsoil. Small- to medium-sized areas are widely scattered along the narrow colluvial belt at the base of the steep Cumberland escarpment. The soil is closely associated with Sequatchie and Barbourville soils and with other Allen soils.

The soil differs from Allen fine sandy loam, eroded rolling phase, chiefly in occupying stronger slopes, in being slightly shallower, and in being more variable in thickness.

The present surface layer is grayish-brown to light yellowish-brown very friable fine sandy loam. The subsoil is yellowish-red or red friable silty clay loam or fine sandy clay loam. In all places limestone underlies the soil at depths of 3 feet or more.

Use suitability.—All of this soil is used for general field crops and pasture. A large proportion is in unimproved pasture. Some is idle. The soil is medium to low in natural fertility and moderate in water-supplying capacity. It is productive of close-growing crops and pasture if adequately fertilized, but it is not suited to row crops. Runoff and erosion make it difficult to conserve the soil if it is used for row crops. If row crops are grown, it is best to grow them in a long rotation that consists of close-growing crops. This soil is in management group 13.

Allen clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Aa).—This soil of the old colluvial lands is well drained, deep, and friable. It has a light-colored surface soil and a red subsoil. It differs from Allen fine sandy loam, eroded rolling phase, chiefly in having stronger slopes, in being severely eroded, in having a generally shallower and more variable depth, and in having thinner layers. The soil is associated with Sequatchie and Barbourville soils and with other Allen soils.

Erosion has removed practically all of the original surface layer and, in many places, the upper part of the subsoil. In most places tillage is now done entirely within the subsoil.

Obviously, the profile of the soil is variable. The top 6 inches is moderately friable clay loam that ranges from yellowish red to yellowish brown. Beneath this is a yellowish-red to red fine sandy clay to clay loam. Limestone underlies the soil practically everywhere at depths of 3 feet or more.

The soil is strongly acid and medium to low in natural fertility. The original surface soil has been lost, but the subsoil allows extensive root penetration and good circulation of air and moisture. The soil is rather difficult to work and conserve, and its water-supplying capacity is moderate.

Included with this soil is about 100 acres on slopes of 5 to 12 percent.

Use suitability.—All of Allen clay loam, severely eroded hilly phase, has been cleared and overcropped. Most of it is now idle or abandoned. Some is reverting to poor-quality forest. Small areas are used for unimproved pasture, and a few for corn. The pastures have a sparse growth of weeds, lespedeza, and sprouts.

The soil has been so severely eroded it is no longer suited to tilled crops. High-quality pasture could be established under careful management, including heavy application of manure and fertilizer. Nevertheless, it would be difficult to get the pasture plants started, because the surface layer is gone and the subsoil now exposed is not a favorable material for root growth. This soil is in management group 14.

Allen stony fine sandy loam, eroded rolling phase (5 to 12 percent slopes) (Ad).—A light-colored surface soil and a red friable subsoil characterize this well-drained deep, friable stony soil of the old colluvial lands. The parent materials washed chiefly from the uplands underlain by sandstone that occupy the tableland above the Cumberland escarpment. This material, along with an appreciable amount of material from limestone, has been deposited at the base of the escarpment and spread out a short distance over the valley. In practically all areas the colluvial deposit is underlain by limestone at depths of 3 feet or more.

The areas of this soil are medium to small and are widely distributed through the narrow colluvial belt along the rim of the valley. The soil developed mainly under deciduous forest. Closely associated with it are areas of Barbourville and Sequatchie soils and of other Allen soils.

Profile description:

0 to 6 inches, light yellowish-brown to light brownish-gray very friable stony fine sandy loam; wooded areas have a thin surface layer stained dark by organic matter.
6 to 13 inches, mingled light yellowish-brown and yellowish-red or reddish-yellow very friable stony clay loam or stony loam; weakly developed fine blocky structure.
13 to 29 inches, yellowish-red or red friable stony sandy clay or stony fine sandy clay loam; moderately well developed medium blocky structure.
29 inches +, yellowish-red friable stony fine sandy clay to stony clay loam, streaked or splotched with pale yellow and brownish yellow.

In many areas much of the original surface layer has been lost through erosion. Consequently, the present surface layer varies in thickness, color, and texture.

It may range from 2 to 10 inches in thickness, and it is heavier in texture because plowing has mixed remnants of the original surface layer with the subsoil. Small severely eroded spots are common, and they are conspicuous because the red subsoil has been exposed.

Included with this soil are uneroded areas covering a total of 60 acres. Allen stony fine sandy loam, eroded rolling phase, is medium to strongly acid and apparently contains a moderate amount of organic matter. Few to many 2- to 8-inch semiangular sandstone fragments are on the surface and scattered through the soil. The stoniness makes the soil more porous and reduces its ability to hold moisture. The soil is medium in fertility and moderate to low in water-holding capacity.

Use suitability.—Practically all of this soil is used for the common field crops and for pasture. Corn and lespedeza are the main crops. A large acreage is in unimproved pasture.

The soil is only moderately well suited to tilled crops. Stones interfere with tillage or make it impractical. Vegetable crops that can be harvested before the dry period in summer might be well suited. The soil also might be suited to crimson clover, red clover, and small grains. Corn and other late-maturing crops are not suited. The soil would be best for permanent pasture. Excellent pasture can be established under careful management. Heavy applications of lime, phosphorus, nitrogen, and potassium are necessary to get good pasture. This soil is in management group 9.

Allen stony fine sandy loam, hilly phase (12 to 25 percent slopes) (Ae).—A thicker surface soil, stronger slopes, and a shallower colluvial deposit differentiate this soil from the eroded rolling phase of Allen stony fine sandy loam. It occurs on the rims of mountain coves and in small areas scattered at the base of the Cumberland escarpment. It is associated with the stony land types, the Barbourville and Sequatchie soils, and with other Allen soils.

Included with this soil are areas totaling about 53 acres that contain stones that greatly interfere with cultivation. Also included are a few areas that have slopes of more than 25 percent.

Use and suitability.—All of this soil is in forest that has been badly cut over and burned over. Because it is erodible, it is difficult to till and conserve if used for tilled crops. If pastures are not fertilized, yields are low. The soil is low in water-supplying capacity and plant nutrients. The numerous stones make clipping of pasture difficult or impossible. Pastures of high quality possibly might be obtained by applying lime and complete fertilizer heavily, by proper seeding, and by careful control of grazing. This soil is in management group 13.

Allen stony fine sandy loam, eroded hilly phase (12 to 25 percent slopes) (Af).—This well-drained, deep, friable stony soil of the colluvial lands has a light-colored surface soil and a red subsoil. Areas occur throughout the narrow colluvial belt at the base of the Cumberland escarpment. Most of the areas cover less than 40 acres.

The soil materials are partly colluvial and partly alluvial. From 25 to 75 percent of the original surface soil has been lost through erosion. In small spots practically all of the original surface soil has been lost. The soil differs from Allen stony fine sandy loam, eroded rolling phase, in having stronger slopes, slightly less erosion, a lower content of organic matter, and a slightly heavier surface layer that is more droughtly and susceptible to erosion. Also, this soil is generally less well supplied with plant nutrients than the eroded rolling phase, and is less productive.

Use and suitability.—All of this soil is cultivated. An estimated 15 percent is in corn, 5 percent in oats, 5 percent in other small grains, 20 percent in hay, and 35 percent in unimproved pasture. About 20 percent is temporarily idle.

Because the soil is hilly and stony, it is not considered suitable for crops. Its very low fertility and poor moisture-supplying capacity limit its productivity for pasture. Nevertheless, the soil is probably best used for pasture on most farms. This soil is in management group 13.

Armuchee silty clay loam, hilly phase (12 to 25 percent slopes) (Ag).—This is a shallow, excessively drained soil of the uplands. It has developed in place from a rock formation consisting of interbedded argillaceous limestone and shale. The limestone lenses in this rock are thin and very closely spaced. The soil is on the strong slopes of ridges, rarely on the top of a ridge. A narrow band of it crosses the entire county from southwest to northeast. It is on the base of a Clarksville ridge and, generally, on the northwest-facing slope. This soil is associated with Clarksville, Greendale, and Pace soils, and with other Armuchee soils.

Profile description:

0 to 7 inches, light brownish-gray heavy silty clay loam; very firm when moist, very hard when dry, and plastic when wet; well-developed medium to coarse blocky structure.

7 inches +, predominantly olive-yellow silty clay loam or silty clay; medium to thick platy structure; extremely firm when moist; extremely hard when dry, and plastic when wet; depth to bedrock ranges from 10 to 15 inches.

Bedrock outcrops are common in most areas. Generally the soil contains numerous small shale and limestone fragments, most of which are calcareous. The soil is about neutral and well supplied with lime, and apparently with potassium also. It is low in phosphorus and nitrogen. Except in the thin surface layer in wooded areas, the supply of organic matter is low. The strong slopes and shallowness of the soil make it hard to work and conserve.

An area of about 10 acres differs from the soil described in having milder slopes (5 to 12 percent).

Use and suitability.—Most of Armuchee silty clay loam, hilly phase, now lies beneath a cutover forest that consists largely of redcedar. This forest cover does not protect the soil well from erosion.

Shallowness, strong slopes, and extreme erodibility are some of the reasons that this soil is not suited to cultivated crops. It is probably best suited to pasture, although it is droughty and for long dry periods only fair pasture would be possible. A shift from forest to pasture probably would not be profitable. Also the distribution of this soil is such that it would be hard to manage. This soil is in management group 17.

Armuchee silty clay loam, steep phase (25 to 60 percent slopes) (Ah).—This is a light-colored, excessively drained soil of the steep uplands. It has developed, in place, from a rock formation consisting of interbedded argillaceous limestone and shale. This soil is on steeper slopes than Armuchee silty clay loam, hilly phase, and is shallower over bedrock. The depth to bedrock is uneven and ranges from about 8 to 10 inches.

The areas of this soil are medium to large and are associated with the hilly phases of both the Armuchee and Clarksville soils.

Use and suitability.—All of this soil is forested with thin stands consisting chiefly of redcedar and mixed hardwoods.

Because it is shallow, steep, and extremely erodible, this soil is not suited to tilled crops and is poor for pasture. On most farms it is best left in forest, although it will probably not produce much high-quality timber. Areas that have been practically cleared by overcutting will be difficult to reforest. This soil is in management group 19.

Barbourville loam (2 to 5 percent slopes) (Ba).—This is a brown or yellowish-brown, well-drained, friable soil consisting of recent colluvial or local alluvial material. Its material washed or rolled from residual soils such as the Hartsells or Muskingum, or from old colluvial soils such as the Jefferson or Allen. It has formed at the base of slopes in small fanlike positions where small lateral drains empty onto larger flood plains or along narrow intermittent drainageways. On the plateau it is underlain by sandstone, and in the valley, by limestone.

The irregularly shaped areas are widely distributed throughout the foothills immediately below the Cumberland escarpment and in a few scattered areas on the plateaus.

Profile description:

0 to 10 inches, yellowish-brown or brown very friable loam; fine granular structure.
10 to 36 inches, brown or yellowish-brown to brownish-yellow and, in places, very dark grayish-brown very friable loam or light clay loam.
36 inches +, yellowish-brown friable loam to clay loam splotched with olive yellow and pale yellow.

This soil is medium to strongly acid. It is apparently high in organic matter and moderately well supplied with plant nutrients. It is practically free of stones but may contain limited amounts of small sandstone fragments. The permeable subsoil permits easy penetration of roots and normal circulation of air and moisture. Water is readily absorbed and well retained. The soil is easy to work and to conserve, and its water-supplying capacity is high. The depth of the colluvial deposit ranges from about 2 to 10 feet.

Use and suitability.—This soil is practically all cleared and is farmed intensively to corn, small grains, hay, and truck crops. With good management, it is well suited to intensive use for crops, particularly corn, hay, and truck crops. It is not particularly well suited to small grains or to cotton. Small grains tend to lodge and mature late, and they are prone to diseases, although yields are good in some places. Alfalfa is sometimes successfully grown on this soil, but apparently red clover does better.

Management should include adequate addition of fertilizer and the maintenance of organic matter by using crop residues, green-manure crops, or barnyard manure. Although this soil is not often flooded, it receives sediments from the adjacent slopes that help to replenish the supply of plant nutrients and organic matter. This soil is in management group 2.

Barbourville stony fine sandy loam (2 to 7 percent slopes) (Bb).—This is a pale-brown or yellowish-brown well-drained stony soil of the colluvial lands. It consists of recent colluvial or alluvial material washed or rolled mainly from Muskingum, Allen, or Jefferson soils. The soil differs from Barbourville loam mainly in containing more stones. It is usually in fanlike positions at the base of slopes or in narrow bands along intermittent drainageways. The very small areas are widely distributed throughout the colluvial foothills. The soil is closely associated with Allen and Sequatchie soils and with the stony land types.

Profile description:

0 to 10 inches, pale-brown to yellowish-brown very friable stony fine sandy loam.
10 to 36 inches, light yellowish-brown to yellowish-brown friable stony loam or stony light clay loam.
36 inches +, light yellowish-brown friable stony clay loam or stony very fine sandy loam splotched with olive yellow and pale yellow.

This soil is medium to strongly acid and is apparently fairly high in organic matter. It is also moderately well supplied with plant nutrients. Surface runoff is moderate. Water is readily absorbed, and internal drainage is moderately rapid. The soil is very permeable to air, roots, and water. Numerous stones, up to 12 inches across, are on the surface and throughout the soil. They interfere with tillage and, in some places, almost prevent cultivation. Some boulders up to 36 inches across are on the soil, but they are not numerous.

Use and suitability.—An estimated 25 percent of this soil is still in hardwood forest. Most of the cleared areas are now used rather intensively for crops, but some are in pasture.

This soil is suited to most crops but, because of its stoniness, yields probably would be lower than on Barbourville loam. This soil is fairly well suited to corn, cotton, hay, and truck crops. Red clover would be better for this soil than alfalfa. Fair crop yields are obtained without amendments, but they are necessary to increase yields or to maintain yields over a long period. A short rotation that includes legumes is desirable.

This soil normally is not subject to floods or to erosion. It is in management group 2.

Bolton silt loam, eroded rolling phase (5 to 12 percent slopes) (Bc).—This deep permeable soil of the uplands is characterized by a brown or dark-brown surface soil and a red subsoil. It has formed from siliceous dolomitic limestone or dolomitic limestone in which thin bands of sandstone are interbedded. A considerable part of the original surface layer has been removed by erosion, and the present surface layer varies somewhat in color, texture, and thickness. The surface soil ranges from brown to reddish brown in color, from loam to silty clay loam in texture, and from 4 to 10 inches in thickness. In a few severely

eroded spots, all of the original surface has been removed and the reddish subsoil exposed. In this county, the soil is confined chiefly to the ridgetops, where it is associated with Fullerton and Clarksville soils and with other Bolton soils. This soil is distinguished from other limestone soils of the area by the friability of the surface soil and subsoil and the darker color throughout the profile.

Profile description:

0 to 7 inches, brown to dark-brown or reddish-brown very friable silt loam; in virgin areas the top 1 or 2 inches is stained dark by organic matter.
7 to 12 inches, reddish-brown friable clay loam to silty clay loam.
12 to 22 inches, red friable to moderately friable silty clay to silty clay loam; contains numerous black or brown concretions and stains.
22 to 44 inches +, red to dark-red moderately friable silty clay loam or silty clay; numerous black or brown concretionary particles and stains dispersed throughout this layer.

This soil is medium acid and is fairly high in plant nutrients and organic matter. It is permeable to air, roots, and moisture. Its capacity to hold water and fertilizer is high. There are very few stones, although a few angular chert or sandstone fragments occur on the surface and throughout the soil.

Use and suitability.—Nearly all of this soil has been cleared. An estimated 30 percent is now in cultivated crops and 50 percent in hay or pasture. About 20 percent lies idle.

This soil is very well suited to all the common crops, including alfalfa and other deep-rooted legumes. This soil cannot be used intensively for crops because of its erodibility. It needs a rotation of medium length that includes close-growing crops. A row crop can safely be grown once every 4 to 6 years if fertilization and other management are good. Since the soil is confined chiefly to the narrow ridgetops, however, its use is generally governed by the use of the adjacent Bolton soils. This soil is in management group 9.

Bolton silt loam, hilly phase (12 to 25 percent slopes) (Bd).—A dark-brown surface soil and a red subsoil characterize this deep permeable soil of the uplands. It has developed from siliceous dolomitic limestone or dolomitic limestone containing thinly interbedded bands of sandstone. Most of it is on the southeast-facing slopes of the relatively high, narrow ridges that run parallel with the valley. The cherty Clarksville and Fullerton soils are ordinarily on the opposite side of the slopes, and the ridgetops form the dividing line. Bolton silt loam, hilly phase, is also associated with Hermitage soils and with other Bolton soils.

Profile description:

0 to 8 inches, dark-brown to reddish-brown very friable silt loam; upper 2 inches stained dark by organic matter.
8 to 12 inches, reddish-brown to yellowish-red friable clay loam to silty clay loam; weakly developed fine blocky structure.
12 to 22 inches, red friable silty clay loam; plastic when wet; moderate to well developed blocky structure.
22 to 44 inches +, red or dark-red friable to firm silty clay loam or silty clay; well-developed medium blocky structure; black specks and stains numerous throughout; an occasional black concretionary aggregate is common; below 44 inches yellow splotches are noticeable; bedrock at depths of 10 to 20 feet or more.

The soil is medium acid and fairly well supplied with organic matter and plant nutrients. Although practically stone free, it has a few small angular chert fragments on the surface and throughout. The soil is easily penetrated by roots and is permeable to air and moisture. The water-supplying capacity is high. Conservability is only fair because of the strong slopes.

Use and suitability.—All of this soil lies beneath a cutover hardwood forest. It is fair for crops but probably better for pasture. The strong slopes make it somewhat difficult to work and highly susceptible to severe erosion, especially when it is bare or planted to row crops. Although it has fairly high natural fertility, the addition of fertilizer or manure would increase crop yields. This soil is in management group 13.

Bolton silt loam, eroded hilly phase (12 to 25 percent slopes) (Be).—This is a well-drained, friable soil of the hilly uplands. It differs from Bolton silt loam, hilly phase, chiefly in having lost some of the original surface layer through erosion. In a few small severely eroded spots, all of the surface soil has been removed and the reddish-colored subsoil is exposed.

The present surface layer is a brown to dark-brown friable silt loam to clay loam. The subsoil is a red friable to firm silty clay loam. This soil is widely distributed in small areas scattered throughout the hilly limestone uplands.

The soil is medium to strongly acid. It contains a moderate supply of organic matter and plant nutrients, even though the layer that contained the most organic matter has been removed. Although the soil is practically free of stones, a few small angular chert fragments are on the surface and throughout the soil. The soil is easily penetrated by roots and is permeable to air and moisture. It has a high capacity for supplying water to plants.

Use and suitability.—All of this soil has been cleared of its hardwood forest and is now used for crops and pasture. About 30 percent is in crops, mainly corn and cotton; the rest is in hay and pasture. The pastures are generally unimproved and of low quality. The hay consists chiefly of lespedeza.

This soil is fairly well suited to crops. It is probably much better for pasture. The moderately strong slopes make it somewhat difficult to work and very erodible if it is bare of vegetation or in row crops. It will produce, however, all crops common to the county, and especially alfalfa and red clover. If the fertility is to be maintained at a high level, the application of fertilizers is necessary. This soil is in management group 13.

Bolton silty clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Bf).—This is a well-drained friable soil of the hilly uplands. It differs from the hilly phase of Bolton silt loam chiefly in having lost nearly all of the surface soil through erosion. Generally the erosion is uneven. In many areas practically all of the original surface soil has been lost, and even the upper part of the subsoil. In these areas tillage is now entirely within the subsoil, and gullies 1 to 2 feet deep are common. In contrast, on some intergully areas several inches of the original surface soil remains.

The present surface layer ranges from dark brown to red and from a clay loam to silty clay loam or silty clay. It is friable to firm and is plastic when wet. The subsoil is a red or dark-red firm to friable silty clay to silty clay loam.

As mapped, this separation includes about 20 acres that lies on steeper slopes (25 to 50 percent).

Use and suitability.—All this soil has been cropped. Some of it is still used for crops, but the yields are very low. Most of the acreage is idle or abandoned and is sparsely covered with weeds, brush, and sprouts. Some is reverting to forest that consists chiefly of Virginia pine.

In its severely eroded state, this soil is very poorly suited to crops or pasture. It is much better suited to pastures than to crops, but pasture is rather difficult to establish. Once the pasture plants are well rooted, however, they should produce high-quality forage, particularly if they are properly fertilized and grazing is controlled. Erosion has caused loss of plant nutrients, lowered the water-supplying capacity, and increased the danger of further erosion. On many farms this soil may best be used for forestry. This soil is in management group 14.

Bouldery colluvium, Allen soil material (12 to 60+ percent slopes) (Bg).—This is an extremely stony and bouldery land type. It lies in long narrow bands on hilly and steep talus slopes below sandstone escarpments. It consists of sandy colluvial materials that contain many stones and boulders ranging in size from a few inches to as much as 20 feet across. Practically all of the material has washed or rolled from the Cumberland escarpment, and much of it is lying on the limestone that is below the sandstone. Most of the sandstone boulders are 3 to 6 feet in diameter, and they occupy 35 to 50 percent of the land surface. The material between stones and boulders is very sandy and of variable depth and color. There is no soil development other than a thin accumulation of organic matter in the surface layer. All of the separation is in the Rockland, limestone-Bouldery colluvium-Rockland, sandstone soil association.

Use and suitability.—Practically all of this land type is in timber, though a few small isolated areas are used for pasture.

This land type is unsuited to crops and poorly suited to pastures. It is low in fertility and too droughty to produce good pasture. Control of weeds is difficult, and because the soil material is sandy, pasture sods will not withstand trampling by animals. The land type is best suited to timber; it is in management group 19.

Bruno loamy fine sand (less than 3 percent slopes) (Bh).—This is an extremely sandy, excessively drained, yellowish-brown soil of the bottom lands. The alluvium from which it formed has washed chiefly from uplands underlain by sandstone, but some limestone materials are included. The soil occupies almost level flood plains. Small scattered areas are along all of the larger streams, but most of them are along the Sequatchie and Little Sequatchie Rivers.

Profile description:

0 to 14 inches, light yellowish-brown to dark yellowish-brown loose loamy fine sand.
14 to 36 inches, yellowish-brown or brownish-yellow loose noncoherent fine sand.
36 to 48 inches +, yellow or pale-yellow loose noncoherent fine sand.

This profile varies considerably in distinctness, thickness, and color of layers. The soil is medium to strongly acid. Its content of organic matter and plant nutrients is low. Surface runoff is slow, and the internal drainage is very rapid. The water-holding capacity is low. The soil is extremely permeable to air and roots. The soil is easily worked with horse-drawn implements, but the loose sandy surface soil gives poor traction for tractors. It can be worked within a wide range of moisture content.

Use and suitability.—Most of this soil is used for pasture and crops, principally corn, cotton, and lespedeza. Pastures are generally poorly managed and consist mainly of broomsedge. A considerable acreage is left idle because it is sometimes flooded, or because it is badly dissected by old stream channels.

The soil is only fair for crops and pasture. If cultivated, it should be used largely for summer annuals. Addition of nitrogen, phosphorus, and potassium is necessary for most crops. Pasture is difficult to establish and maintain, and yields are low, especially in dry seasons. This soil is in management group 1.

Capshaw silt loam, undulating phase (2 to 5 percent slopes) (Ca).—This soil is moderately well drained. In position and age, the old terraces on which it occurs are about halfway between the low and the high terraces. Very few areas are now flooded. The soil has formed in old alluvial deposits, most of which were of limestone origin. Limestone underlies the soil at depths of 3 feet or more. Deciduous forest covered this soil during its formation.

Most areas of this soil are within one major belt that runs the entire length of the valley near the west side. Large areas are in the vicinity of Sulphur Spring School. Etowah, Taft, and Robertsville soils and other Capshaw soils are associated with this soil.

Profile description:

0 to 8 inches, brown very friable silt loam; weak fine crumb structure.
8 to 24 inches, strong-brown to yellowish-brown friable to firm silty clay loam; weak to moderate blocky structure; gradation to yellowish brown in lower 4 inches.
24 to 30 inches, yellowish-brown friable to firm silty clay loam, splotched with yellow and gray; moderately developed medium blocky structure; numerous small black concretions dispersed throughout this horizon.
30 inches +, light-gray, splotched with yellowish brown, slightly compacted heavy silty clay loam; contains many black concretions and small chert fragments or gravel; limestone bedrock at depths of 3 to 15 feet.

The soil is medium to strongly acid and low in plant nutrients and organic matter. It is practically free of stones, but thin beds of gravel or cobblestones occur at various depths. Normally these stones are at the base of the deposit. The soil is permeable to roots, air, and moisture. The surface soil and subsoil readily absorb moisture, but the slightly compacted substratum retards movement of both air and moisture. External and internal drainage are medium. The soil is easy to work and conserve, and its water-supplying capacity is about medium.

Use and suitability.—Almost all of this soil is used

for crops and pasture. A large acreage is in corn, crimson clover, small grains (chiefly oats), and cotton. Hay and pasture occupy an estimated 35 percent, and between 10 and 15 percent of the soil is idle.

This soil is well suited to most crops other than alfalfa. Corn, cotton, soybeans, red clover, and crimson clover are well suited. They can be used in a short rotation, provided the supply of organic matter and plant nutrients is kept at a high level by returning crop residues and barnyard manure, growing green-manure crops, and applying commercial fertilizer. The soil is particularly low in lime and phosphorus. Heavy applications of these will be necessary for practically all crops. Nitrogen and potassium are needed to get high yields. This soil is in management group 5.

Capshaw silt loam, eroded undulating phase (2 to 5 percent slopes) (Cb).—This moderately well drained soil has developed from old mixed alluvial deposits, most of which were of limestone origin. Limestone underlies the soil practically everywhere. In position and age the old terraces are about intermediate between the low and high terraces, and few of them are ever flooded. The soil has formed under deciduous forest.

This soil extends, in one major belt, the entire length of the valley near the west side. Typical areas are in the vicinities of Sulphur Spring School, and Powells Crossroads. This soil is associated with Etowah, Taft, and Robertsville soils and with other Capshaw soils.

Profile description:

0 to 7 inches, brown very friable silt loam; weak fine crumb structure.
7 to 24 inches, strong-brown to yellowish-brown friable to firm silty clay loam; weak to moderate medium blocky structure; grades to yellowish brown in lower 4 inches.
24 to 30 inches, yellowish-brown friable to firm silty clay loam splotched with yellow and gray; moderately developed medium blocky structure; many small black concretions dispersed throughout this layer.
30 inches +, light-gray heavy silty clay loam splotched with yellowish brown; slightly compacted; contains many black concretions and small chert fragments or pebbles; limestone bedrock at depths of 3 to 15 feet.

This soil is medium to strongly acid and low in plant nutrients and organic matter. It is practically free of stones, but thin beds of gravel or cobblestones may be at various depths, most often near the base of the deposit. The soil is satisfactorily permeable to roots, air, and moisture. The surface soil readily absorbs moisture, but the slightly compacted substratum somewhat retards its movement. Surface drainage is moderate and internal drainage is moderately slow. The water-supplying capacity is about medium.

Use and suitability.—All of this soil is used for crops and pasture. An estimated 10 to 15 percent is idle each year, but there are many new or improved permanent pastures. This is one of the more important soils in the county.

This soil is well suited to most crops. Alfalfa or other crops especially sensitive to rather slow internal drainage are not suitable. Crops can be used in a short rotation, provided a high level of fertility is achieved through the return of crop residues and green manure or the application of barnyard manure and commercial fertilizers. Erosion is not hard to control, and the soil is rather easy to work and to conserve. The strong acidity should be counteracted by applying lime heavily. All crops need a complete fertilizer, in addition to the lime. This soil is in management group 5.

Capshaw silt loam, eroded rolling phase (5 to 12 percent slopes) (Cc).—This is a moderately well drained soil of old stream terraces. It differs from the eroded undulating phase of Capshaw silt loam mainly in occupying stronger slopes. The stronger slopes have caused greater loss of surface soil and reduced the total depth of the alluvial deposit. The soil averages somewhat shallower than the eroded undulating phase, and its productivity has been lowered.

The present surface layer varies greatly because of unequal erosion. It is generally a brown to yellowish-brown silt loam to silty clay loam. In a few severely eroded spots the subsoil is exposed. The subsoil is a strong-brown to yellowish-brown firm to friable silty clay loam, splotched with yellow and gray below 20 inches. This soil is least important of the Capshaw soils because of its limited acreage.

Use and suitability.—All of this soil is used for field crops and pasture. Yields are generally low, and most of the pastures are unimproved and consist mainly of volunteer or wild plants. An estimated 15 percent of the soil is idle each year.

Although this soil is fair for crops and pasture, stronger slopes and erosion make it less desirable than the undulating phases of Capshaw silt loam. Erosion is moderately difficult to control. Rotations should be of at least medium length and include close-growing crops. The soil is low in lime, phosphorus, potassium, and nitrogen, but it responds to good management. The response to fertilizer is not so great nor so lasting as for the associated Etowah or Cumberland soils. This soil is in management group 10. Fertilization is necessary if a high yield is to be obtained and maintained.

Clarksville cherty silt loam, steep phase (25 to 60 percent slopes) (Cf).—This soil is light colored, extremely cherty, and excessively drained. Low-grade dolomitic limestone is its parent material. The soil is the most extensive of the Clarksville soils and occupies the steepest slopes. Medium to large areas are on the slopes of long narrow steep ridges. They are associated with Fullerton, Greendale, and Bolton soils and with other Clarkesville soils.

Profile description:

0 to 6 inches, light brownish-gray to grayish-brown friable cherty silt loam.
6 to 16 inches, light yellowish-brown, brownish-yellow, or yellowish-brown friable cherty silt loam or cherty silty clay loam.
16 to 48 inches, very cherty silt loam or very cherty silty clay loam splotched with yellow, brown, gray, and red; cherty limestone strata under this layer at depths of 4 feet or more.

Considerable quantities of small and large chert fragments are on the surface and are embedded in all layers. The quantity varies greatly from place to place. The size of the chert fragments ranges from about ¼ inch to 4 inches in diameter. Small accumulations of colluvial chert fragments are piled up at the base of some slopes in masses several feet thick.

The soil varies greatly in color and in thickness. Along the lower part of many slopes, the surface soil

is deeper than described because material has washed from the higher slopes. Bedrock outcrops are common on some of the steeper slopes.

The soil is strongly to very strongly acid and very low in plant nutrients. A thin deposit of leaves and forest litter covers the soil, but there is very little organic matter in the soil. The soil is very permeable to air and moisture, but it has a very low water-supplying capacity. Surface runoff is very high, and internal drainage is rapid.

Use and suitability.—All except about 53 acres of this soil is covered by hardwood forests consisting principally of oaks and hickory, mixed with some gum, sourwood, pines, and dogwood. In places the undergrowth is huckleberry and mountain-laurel. This soil is poorly suited to crops or pasture by reason of its steep slopes, chertiness, low fertility, and little moisture. The handicaps involved in farming a soil with such properties limit its practical use to forestry. It would be difficult to work and conserve if cleared. This soil is in management group 18.

Clarksville cherty silt loam, hilly phase (12 to 25 percent slopes) (Ce).—This is a light-colored excessively drained soil of the uplands. It was derived from materials weathered from cherty dolomitic limestone. Large amounts of angular fragments of chert are common on the surface and in the soil layers.

The soil is associated mainly with other Clarksville soils and with members of the Fullerton and Bolton series. The areas are thinly distributed throughout the Fullerton-Clarksville-Greendale soil association.

The soil differs from Clarksville cherty silt loam, steep phase, in having less steep slopes and somewhat thicker, more distinct layers. All of this soil is covered with a mixed growth of hardwoods. Post, chestnut, red, white, and blackjack oaks and hickories are the principal trees.

The surface soil is brownish-gray to grayish-brown friable cherty silt loam. The subsoil is light yellowish-brown friable cherty silty clay loam or heavy cherty silt loam, 10 to 18 inches thick. The substratum is a light yellowish-brown cherty silty clay loam variegated with shades of yellow, red, brown, and gray.

The soil is strongly to very strongly acid and is low in organic matter and plant nutrients. It is permeable to roots, air, and water. External and internal drainage are rapid. The water-supplying capacity is very low.

Use and suitability.—All of this soil is now in forests that have been cut over a number of times. The present stand is sparse and contains only a few marketable trees.

The suitability of this soil for crops is poor because of strong slopes, chertiness, low fertility, and low water-supplying capacity. Cleared areas offer some possibilities for use as pastures, although good management is essential to establish and maintain them. It appears that the use of this soil for forest is most practical on nearly all farms. This soil is in management group 15.

Clarksville cherty silt loam, rolling phase (5 to 12 percent slopes) (Cd).—This is a light-colored soil located on narrow ridge crests, chiefly in the strongly dissected uplands. The ridges and their spurs are usually either eliptical or nearly level to irregularly sloping and rolling. The slopes are milder than those of other Clarksville soils.

The soil has formed from materials weathered from chert or very cherty dolomitic limestone, under a growth of oaks, and hickory, and other hardwoods. Associated soils on adjoining slopes are chiefly other phases of the Clarksville series and Fullerton and Bolton soils. This soil is distributed thinly throughout the Fullerton-Clarksville-Greendale soil association.

Profile description:

0 to 6 inches, brownish-gray or grayish-brown, porous, cherty silt loam; low in organic matter; 4 to 6 inches thick.

6 to 18 inches, light yellowish-brown to yellowish-brown moderately friable, cherty, light silty clay loam, faintly splotched with gray and red in places, and intermixed with variable amounts of cherty fragments; 10 to 15 inches thick.

18 to 48 inches +, mottled yellow, brown, and gray cherty silty clay loam; contains angular chert fragments; beds of chert or cherty limestone extend to considerable depth.

In wooded areas, a thin layer of forest litter covers this soil and the upper 1 or 2 inches of the surface layer is stained dark with organic matter. In places the surface is almost entirely covered with angular chert fragments ranging from less than 1 inch to 8 inches or more in diameter. The chert interferes with tillage.

The soil is strongly to very strongly acid and low in organic matter and plant nutrients. Surface runoff is medium, and internal drainage is rapid. The soil is permeable to roots, air, and water but holds little moisture and tends to be droughty.

Use and suitability.—All this soil is now in cutover forests. The trees are small and of poor quality. This soil is poor for crops because it is cherty, low in fertility, and low in moisture-supplying capacity. Furthermore, it is on very narrow ridges. Many areas are quite isolated and others are difficult or inconvenient to reach. Clearing and cultivating this soil does not appear practical. Yet, under a high level of management, including the use of amendments and a careful selection of crops, fair crop yields might be obtained. The soil is probably better suited to pasture, but yields would be low in dry periods. It appears best to leave this soil in forest. It is in management group 10.

Cobbly alluvium, Staser and Sequatchie soil materials (less than 3 percent slopes) (Cg).—This miscellaneous land type consists of very stony alluvium washed mainly from uplands underlain by sandstone. It lies along all the major streams, but most of it is in mountain coves, particularly near the heads of the coves.

This land type is variable because its materials are variable. The predominant color is light yellowish brown. Texture varies from loamy sand to loam. Gravel and cobblestones constitute a large proportion of the entire soil mass. The depth ranges from 15 to 30 feet or more.

This land type is medium to strongly acid. The content of organic matter and plant nutrients is rather low. The porous friable soil material permits easy penetration of roots, air, and water Most of this land

Figure 3.—**Low-quality pasture and weedy growth on Cobbly alluvium, Staser and Sequatchie soil materials.**

type, however, is periodically overflowed and it is too stony for cultivation.

Use and suitability.—An estimated 65 percent of this land type is in cutover forest. The rest is used mainly for pasture (fig. 3), but a few areas are used for corn and truck crops. Some is idle.

All of this land is too cobbly for cultivation. It is fair for pasture on most farms, although the yields would be low. It is low in fertility and in ability to hold moisture and plant nutrients. This land type is in management group 17.

Colbert silty clay loam, eroded rolling phase (5 to 12 percent slopes) (Ch).—This is a strongly plastic, shallow soil of the uplands. It has a grayish-brown surface soil and brownish-yellow or olive-brown subsoil. It has developed from clayey limestone residuum. Slopes range from 5 to 12 percent, but most of the soil is in the lower part of this slope range. Small areas are scattered throughout the valley. Apparently, the removal of terrace deposits that formerly covered this soil has caused its present pattern. It occurs in spots rather than large areas. Associated are the Etowah, Capshaw, and Talbott soils and the stony land types.

Profile description:

0 to 6 inches, grayish-brown firm silty clay loam to silty clay; fine blocky structure.
6 to 16 inches, brownish-yellow extremely firm clay; contains many very dark gray or black stains; strongly developed very coarse blocky or massive structure; extremely hard when dry and strongly plastic when wet.
16 inches +, light olive-brown to olive-brown and brownish-yellow extremely firm clay that has splotches, streaks, stains, or specks of very dark gray or black; strongly developed very coarse blocky structure; limestone bedrock at a depth of 26 inches.

This soil is medium acid. It is low in organic matter and moderately low in plant nutrients. The heavy subsoil retards the movement and absorption of air and moisture, and plant roots penetrate it with difficulty. Surface runoff is moderately rapid, and internal drainage is slow or very slow. The water-supplying capacity is low.

In this soil the thickness of the layers and depth to bedrock vary considerably. Flat limestone fragments and outcrops of limestone bedrock are common in most of the areas. Most of this soil has lost from 25 to 50 percent of the surface layer. In a few severely eroded spots, nearly all the original surface soil has been lost and the yellowish subsoil is exposed.

Use and suitability.—All of this soil is used for crops and pasture. It is poorly suited to row crops. It is very difficult to work and to conserve and has poor tilth. The moisture range over which the soil can be safely tilled is very narrow. The heavy clayey subsoil tends to make the soil extremely wet or dry. The soil would be better for pasture, but it would be droughty during long dry periods. It is often hard to establish pasture. Fertilization is necessary, and for even a fair pasture, the grazing would have to be carefully controlled. When this soil is exposed to the sun, moisture evaporates rapidly and the soil quickly becomes dry and hard. Most pasture plants cannot withstand these conditions very long. This soil is in management group 11.

Cotaco and Atkins silt loams (0 to 3 percent slopes) (Ck).—These are imperfectly drained soils on local alluvial-colluvial deposits. The pattern of these soils is so intricate it is not feasible to separate them. They have formed from materials washed or rolled mainly from the Hartsells and Muskingum soils.

These soils are in narrow bands along intermittent drainageways, although a considerable acreage is in saucerlike depressions near the heads of drains. Areas are small and widely scattered over isolated sections of the Cumberland Plateau in association with Hartsells, Muskingum, Linker, and Barbourville soils. Only a very few areas are in the valley, and these are near the base of the mountains.

Profile description (Atkins silt loam):

0 to 7 inches, grayish-brown to dark grayish-brown very friable silt loam, faintly mottled with gray or brownish gray; weak medium crumb structure.
7 to 12 inches, grayish-brown to gray (nearer gray) friable heavy silt loam to silty clay loam, streaked and stained with reddish brown.
12 to 44 inches +, brownish-gray, strong-brown, and yellow friable to firm very fine sandy clay, profusely splotched or mottled with gray; gray color becomes predominant with increasing depth; structure nearly massive; water table normally at a depth of about 30 inches.

Profile description (Cotaco silt loam):

0 to 9 inches, yellowish-brown or pale-brown very friable silt loam.
9 to 20 inches, yellowish-brown friable or very friable heavy silt loam, faintly or moderately mottled with light gray or light brownish gray; gray increases with depth.
20 inches +, predominantly light-gray to light brownish-gray friable to firm silt loam to silty clay loam, splotched with yellowish brown and brownish yellow; many reddish-brown streaks or stains are in this layer.

These soils are very strongly acid, low in organic matter, and low in plant nutrients. Surface runoff is slow, and areas in the saucerlike depressions around heads of drains have no surface drainage and are often ponded during winter and following heavy rains in fall and spring. Internal drainage is generally slow. These soils absorb and retain moisture well, but they are quickly saturated.

Use and suitability.—Most areas of these soils are in forest. The trees are chiefly deciduous, and many

are of water-tolerant species. Some areas are in unimproved pasture, and a small acreage is cultivated.

Poor drainage limits the use of these soils. The better drained areas are fair for crops such as corn and vegetables, but they are not suitable for small grains and alfalfa.

The soils are fairly easily tilled when at the proper moisture content, but they are saturated much of the time in wet seasons. The ponded areas and other poorly drained areas are poor for crops, and it is best to use them for pasture or allow them to remain in timber. These soils are in management group 16.

Crossville loam, rolling phase (5 to 12 percent slopes) (Cl).—This is a well-drained friable soil that developed from the residuum of nearly level-bedded acid sandstones. The soil is normally on rather long and mild east-facing slopes in association with the Hartsells, Linker, and Muskingum soils. It differs from the Hartsells soils in being much browner in the upper 14 inches and generally somewhat shallower over sandstone bedrock. It has developed under a predominantly deciduous forest.

Profile description:

0 to 1 inch, very dark gray friable loam high in organic matter; soft fine crumb structure.
1 to 6 inches, dark-brown very friable loam to silt loam; medium weak crumb structure; gradual transition to layer below.
6 to 13 inches, dark-brown very friable clay loam to silty clay loam; weakly developed fine blocky structure.
13 to 20 inches, yellowish-brown friable silty clay loam to clay loam; weakly developed fine blocky structure.
20 to 26 inches, yellowish-brown friable clay loam to silty clay loam, faintly splotched or mottled with strong brown; weakly developed fine blocky structure; contains many small pebbles weathered from fine-grained conglomerate; layer rests upon sandstone bedrock.

The soil is strongly acid and apparently low in natural fertility. It allows easy penetration of roots. It is easy to work and moderately easy to conserve. Water is readily absorbed and fairly well retained. The water-supplying capacity is about medium. The soil is practically free of stones.

Use and suitability.—Nearly all this soil is still forested. A few areas have been cleared and are used chiefly for truck crops and corn.

Actually, this soil is well suited to all crops and pasture plants commonly grown. Its shallowness to bedrock restricts the feeding zone for the deep-rooted crops, but generally it is deep enough for successful growth. Erosion control and proper fertilization are extremely important. The response to fertilizer should be good. This soil is in management group 8.

Cumberland silty clay loam, eroded undulating phase (2 to 5 percent slopes) (Cm).—This well-drained soil is on the old high stream terraces, most of which are 50 to 150 feet above the present flood plains. The parent material washed largely from uplands underlain by limestone, though it generally includes some materials from a variety of rocks, including shale and sandstone. Practically all of these terrace deposits are underlain by limestone at depths of 5 to 20 feet or more. The soil has formed under a deciduous forest.

The areas are of medium size and are scattered thinly throughout the valley. They are closely associated with areas of Waynesboro, Etowah, and Emory soils.

Profile description:

0 to 10 inches, dark-brown to dark reddish-brown friable to very friable silt loam to silty clay loam.
10 to 21 inches, dark reddish-brown to dark-red moderately friable silty clay or heavy silty clay loam; fine to medium blocky structure.
21 to 40 inches +, red to reddish-brown firm silty clay or silty clay loam; well-developed medium blocky structure; contains many black stains.

In most places part of the original surface layer has been lost through erosion. There has been some mixing of the subsoil with the surface soil, and the present surface layer varies greatly in color and texture within short distances. It ranges from brown to reddish brown in color and from silt loam to silty clay loam in texture. Small severely eroded spots are common; these are conspicuous because the red subsoil is exposed. Almost one-third of the total area is only slightly eroded, and a very small part of this is not cleared. As mapped, this soil includes about 50 acres having a surface soil that is nearer a loam than silt loam.

This soil is medium to strongly acid, and its content of organic matter apparently is moderate to high. It has a moderately large supply of plant nutrients. In places a few small cobblestones are on the surface and throughout the profile; small dark-brown concretions are common in the lower part of the soil.

The soil is permeable to roots, air, and moisture. Rainfall is readily absorbed and very well retained. The water-supplying capacity is high.

Use and suitability.—Practically all of this soil is used for crops and pasture. Little lies idle. This soil is easy to work and conserve. It is on favorable slopes and is fertile; consequently it is well suited to rather intensive use for all field crops, including alfalfa. There is not quite enough lime, phosphorus, and nitrogen for maximum yields. Lime and phosphorus are generally considered essential for red clover and alfalfa. This soil is in management group 4.

Cumberland silty clay loam, eroded rolling phase (5 to 12 percent slopes) (Cn).—This is a well-drained fertile soil on high stream terraces. It has a browner surface soil and a darker red and somewhat less friable subsoil than the associated Waynesboro soils. The soil has developed from old alluvium that washed chiefly from limestone materials. In contrast, the parent material of the Waynesboro soils contains considerable shale and sandstone materials.

The areas of Cumberland silty clay loam, eroded rolling phase, are of medium size and are scattered throughout the valley. They are closely associated with areas of Waynesboro, Etowah, and Emory soils and with other Cumberland soils.

The native vegetation is chiefly deciduous hardwoods. The important species are oaks, hickories, chestnut, yellow-poplar, and maples.

Profile description:

0 to 8 inches, dark-brown to dark reddish-brown friable to very friable silt loam to silty clay loam.
8 to 21 inches, dark reddish-brown to dark-red moderately friable silty clay or heavy silty clay loam; fine to medium blocky structure.

21 to 38 inches +, red to reddish-brown firm silty clay or silty clay loam; well-developed medium blocky structure; contains many black stains.

Very small dark-brown or nearly black concretions are common in the subsoil and substratum. The terrace deposit varies in thickness but generally is more than 3 feet thick. In a few places it is 15 feet or more. Where the terrace deposit is less than 3 feet thick, the subsoil is not so deep or friable as described.

The thickness of the surface layer varies with the degree of erosion. In some places the surface layer is less than 6 inches thick and some subsoil material has been mixed with it in tillage. Some pebbles and cobblestones are on the surface and throughout the profile, but not enough to interfere with cultivation. As mapped, the surface texture of a few of the areas is nearly a loam. The entire profile is medium to strongly acid.

Use and suitability—Practically all of this soil is used for pasture and most of the commonly grown crops.

This soil is suited to many different crops, including alfalfa and red clover. It is apparently very well suited to alfalfa. Chiefly because of its slope and erodibility, this soil is not suited to intensive use. Rotations will need to be of moderate length and include close-growing crops. A row crop may be grown safely once every 4 years if management is good. Although good yields of nearly all crops are obtained without fertilizers, application of plant nutrients is necessary if yields are to be increased and kept high. This soil has a high capacity to hold water and plant nutrients. It is in management group 9.

Cumberland silty clay loam, eroded hilly phase (12 to 25 percent slopes) (Co).—This soil of the old high stream terraces is well drained. It has stronger slopes than the eroded rolling phase of Cumberland silty clay loam. Generally it is also more variable in color, texture, stoniness, and depth. Surface runoff is more rapid, and in most areas more of the original surface soil has been lost. Small severely eroded spots are common. The soil formed from old alluvium that washed chiefly from uplands underlain by limestone.

The surface soil is a brown to dark reddish-brown silty loam or silty clay loam, and the subsoil is dark-red to reddish-brown firm silty clay loam or silty clay. Some of the surface soil contains sandstone, quartzite, limestone materials, and an appreciable amount of sand.

Use and suitability.—Practically all of this soil is used for general field crops and pasture. It is moderately well suited to tilled crops, but use is somewhat restricted by erosion. Choice and rotation of crops, tillage practices, fertilization, and measures for water control are more exacting than for Cumberland silty clay loam, eroded rolling phase. To maintain yields, longer rotations that include a greater proportion of close-growing crops are required, and more organic matter must be supplied by growing legume crops for green manure. Contour plowing should also be used. The steeper more eroded areas are probably better for hay or permanent pastures. This soil is in management group 13.

Cumberland silty clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Cp).—This soil differs from Cumberland silty clay loam, eroded rolling phase, chiefly in being severely eroded and in occupying stronger slopes. Practically all of the original surface soil and, in places, a part of the subsoil have been lost through erosion. This soil occurs in small widely scattered areas throughout the valley. It is associated with Waynesboro and Etowah soils and with other Cumberland soils.

The present surface layer consists of the remnants of the original surface layer mixed with the upper part of the subsoil. This layer is brown or reddish-brown moderately friable silty clay loam. The subsoil is dark-red, reddish-brown, or yellowish-red firm silty clay or heavy silty clay loam.

Shallow gullies are common, and there are occasional noncrossable gullies. A total of about 80 acres differs from the soil described in having slopes of 5 to 12 percent.

Use and suitability.—All of this soil has been used for crops and pasture. A considerable part is now idle or has been abandoned. Organic matter and plant nutrients have been lost through erosion, which is likely to continue if the soil is used for row crops. This soil is probably best used for semipermanent hay crops or for permanent pasture. It is in management group 14.

Emory silt loam (2 to 7 percent slopes) (Ea).—This brown well-drained soil of the colluvial lands consists of young colluvial or local alluvial materials that came mainly from the Etowah, Cumberland, Bolton, and Waynesboro soils. The soil is in relatively narrow and elongated areas at the bases of slopes, along narrow intermittent drainageways, and in small well-drained depressions. It is fairly well distributed throughout the valley.

Profile description:

0 to 20 inches, dark-brown to brown friable or very friable silt loam.
20 to 40 inches, reddish-brown to yellowish-brown friable silt loam to silty clay loam; usually has a few splotches in the lower part.
40 to 60 inches, yellowish-brown, moderately friable silty clay loam to heavy silt loam.

The depth of the accumulation ranges from 3 to 10 feet or more. The soil varies somewhat from place to place, depending largely on the kind of soil from which its parent material washed. Although it was derived predominantly from limestone, the soil includes some sandy material in many places. Near the mountain base it grades into the Barbourville soils.

In most places the color is similar to that of the adjacent upland soils. As mapped, this soil includes a few areas of soils formed from materials that did not accumulate on gentle foot slopes, but in shallow well-drained sinks or on narrow bottomlike areas along intermittent drainageways.

Emory silt loam is medium acid. It is apparently well supplied with organic matter and plant nutrients. It is easily permeable to roots, air, and moisture. Water is readily absorbed, and the water-holding capacity is high. Both internal and external drainage

Figure 4.—**Minvale silt loam, eroded rolling phase, on slope in foreground; Emory silt loam between fences in center; and Cumberland silty clay loam, eroded hilly phase, on cleared slope in background.**

are medium. The soil is relatively free of stones, and tilth is good and easy to maintain.

Use and suitability.—All of this soil has been cultivated, and most of it is now used for the common field crops. An estimated 30 percent of the acreage cultivated is in corn, 25 percent in small grains, 30 percent in hay and pasture, and 15 percent in other crops (fig. 4).

Emory silt loam is well suited to intensive use for all commonly grown crops. Productivity and workability are favorable, and management requirements are simple. Ordinarily, good yields of many crops can be obtained without rotating crops or fertilizing, but yields probably could be increased by both. The rotation can be short; for example, a corn, legume, and hay rotation.

Supplies of lime and phosphorus are somewhat low for maximum yields of many crops. Nitrogen and potassium are less likely to be needed. The actual need depends on the cropping system followed. In some places it may be necessary to prevent too much material washing from the slope above. Light deposits ordinarily benefit the soil. This soil is in management group 2.

Etowah silty clay loam, eroded undulating phase (2 to 5 percent slopes) (Eb).—This is a brown well-drained soil on old stream terraces. Most of it is from 25 to 75 feet above the present flood plains. The parent materials washed from uplands underlain chiefly by limestone.

Medium-size areas of this soil are distributed widely throughout the valley, but they occur mainly in one major belt that runs near the west side of the valley. The soil is closely associated with the Capshaw and Cumberland soils and occupies a position between these two.

Profile description:

1 to 6 inches, brown very friable silt loam or silty clay loam.
6 to 10 inches, brown to yellowish-brown or dark yellowish-brown friable heavy silt loam or silty clay loam streaked with yellowish red; weak fine blocky structure.
10 to 29 inches, yellowish-red firm to friable silty clay loam; contains numerous black specks or stains; appears to be a lighter color when crushed; moderately well developed medium blocky structure.
29 to 40 inches +, red firm to friable silty clay loam or silty clay; medium to coarse weak blocky structure; limestone bedrock at depths of 3 to 15 feet.

The soil is medium to strongly acid and is apparently well supplied with organic matter and plant nutrients. It is permeable to air, roots, and water. Surface runoff is slow to medium, and internal drainage is medium. The water-supplying capacity is high. Much of the original surface soil has been removed in some places, but generally plowing is still done within the original surface layer.

Use and suitability.—Practically all areas of this soil are cultivated. An estimated 30 percent is in corn, 20 percent in small grains, 35 percent in hay crops and pasture, and 15 percent in miscellaneous crops. Very little is idle.

This soil is well suited to intensive use. Practically all crops, including tobacco, alfalfa, and truck crops, are successfully grown. The soil is easy to work and to conserve. Management practices therefore are quite simple. The rotations presumably can be short. Although good yields ordinarily can be obtained without amendments, fertilizer and lime are needed to maintain high yields. This soil is believed to be one of the best in the county for alfalfa. It is in management group 4.

Etowah silty clay loam, eroded rolling phase (5 to 12 percent slopes) (Ec).—This is a brown well-drained soil on old stream terraces. It has formed from parent materials washed from uplands underlain mainly by limestone. It differs from the eroded undulating phase of Etowah silty clay loam chiefly in occupying stronger slopes. The soil is, therefore, slightly more eroded, and its layers are somewhat thinner.

The soil occupies medium and large areas scattered widely throughout the valley. It is one of the more important soils in the county. Closely associated with it are Cumberland and Capshaw soils, and other Etowah soils. The soil has formed under deciduous forest.

The present surface soil is a brown friable silt loam to silty clay loam. In places the uppermost part of the subsoil has been mixed with the surface soil in tillage. The mixing has created a finer texture and a reddish tinge. The subsoil is a yellowish-red to red, firm to friable silty clay loam to silty clay. It is underlain nearly everywhere by limestone.

Use and suitability.—All except about 30 acres of this soil is used for crops and pasture.

This soil is well suited to all the commonly grown field crops and pasture plants. It is less desirable for crops than Etowah silty clay loam, eroded undulating phase, but the management requirements are similar. Also, because of losses through erosion, it is lower in organic matter and plant nutrients. The water-supplying capacity is also slightly lower, and there is a greater risk of erosion. Maintaining crop yields at a level comparable to that for Etowah silty clay loam, eroded undulating phase, will require a longer rotation that includes more legumes and grasses, and possibly somewhat heavier applications of lime and phosphorus. Surface runoff is more rapid, and erosion

control is more difficult. This soil is in management group 9.

Etowah silty clay loam, severely eroded rolling phase (5 to 12 percent slopes) (Ed).—This is a well-drained soil of the old stream terraces. The alluvium from which the soil has formed washed chiefly from uplands underlain by limestone. This soil has stronger slopes than Etowah silty clay loam, eroded undulating phase, and is more eroded. It has lost more than 75 percent of the original surface layer and, in places, some of the subsoil. In small areas the original surface layer has been mixed with the subsoil.

In color and texture, the present surface layer varies considerably within very short distances, but generally it is a brown to yellowish-red or red, moderately friable to firm silty clay loam or gritty silty clay loam. The subsoil is a yellowish-red to red silty clay loam to silty clay.

This soil is medium to strongly acid, low in organic matter, moderately low in plant nutrients, and moderately difficult to work and conserve. The loss of organic matter and surface soil through erosion has increased surface runoff; consequently, it is harder to control runoff and further soil loss. There are a few shallow gullies in some areas.

Use and suitability.—All of this soil has been used for crops and pasture. Some small areas are now idle or abandoned.

This soil is suited to many different crops, including alfalfa, but it is poor for intensive growing of row crops. Crops commonly grown are wheat, corn, cotton, alfalfa, lespedeza, soybeans, oats, rye, and vetch. Although seriously damaged by erosion, the soil responds well to good management, and it retains improvements in fertility very well if it is protected against further erosion. This soil is in management group 12.

Etowah silty clay loam, eroded hilly phase (12 to 25 percent slopes) (Ee).—This brown soil of the old stream terraces has developed from materials washed from uplands underlain chiefly by limestone. It has good drainage. Most of this soil is 25 to 75 feet above the present flood plain and lies in medium-sized areas sparsely scattered throughout the valley. It occupies stronger slopes and is more eroded than Etowah silty clay loam, eroded undulating phase.

In most places 25 to 75 percent of the original surface layer has been removed through erosion. A few small severely eroded spots have lost all of the surface soil, and the reddish subsoil is now exposed.

The present surface soil is generally a brown to reddish-brown friable silty clay loam, 4 to 7 inches thick. The subsoil is a yellowish-red to red firm to friable silty clay loam to silty clay. Many cobblestones are on the surface, but not enough to interfere with tillage. Layers of high cobblestone content are common throughout the profile.

Use and suitability.—Practically all of this soil is used for pasture and crops.

This soil is suited to most of the common field crops and pasture plants. It is not so desirable as the eroded rolling and undulating phases of Etowah, because its slopes are stronger. The soil is also generally more eroded, lower in organic matter and plant nutrients, and susceptible to further erosion. Row crops can be grown safely in a long rotation that consists largely of close-growing crops. The close-growing crops afford protection against erosion. If adequately fertilized, the soil produces good pasture and hay. Pasture is probably its best use. The soil is in management group 13.

Etowah silty clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Ef).—This is a brown soil of the old stream terraces. It has good drainage. Limestone underlies it practically everywhere.

There is not a great deal of this soil, and it is thinly distributed in small areas throughout the valley. It is associated with Cumberland, Waynesboro, Capshaw, and Taft soils and with other Etowah soils.

The soil is more severely eroded and occupies stronger slopes than Etowah silty clay loam, eroded undulating phase. Almost all of the original surface soil has been lost.

The present surface soil consists mainly of the upper part of the subsoil, although it contains much of the original surface layer in places, especially between shallow gullies. This layer ranges from brown to yellowish-red or red heavy silt loam to silty clay. There are many shallow gullies.

Use and suitability.—All of this soil has been cleared, and now most of it is idle or is wasteland. A small area is used for pasture consisting mainly of broomsedge and native grasses.

The soil has been reduced to a low state of productivity through erosion and cropping. It is low in organic matter and plant nutrients and has a low water-supplying capacity. Strong slopes and shallow gullies render it difficult to work and to conserve. Because it is severely eroded, this soil is not suitable for row crops. It is probably best suited to pasture and semipermanent hay crops. This soil is in management group 14.

Fullerton silt loam, hilly phase (12 to 25 percent slopes) (Fk).—This is a well-drained soil of the uplands. It has a light-colored or leached surface soil and a yellowish-red or red subsoil. It was derived from rather low-grade dolomitic limestone. Chert in the plow layer and on the surface does not interfere materially with tillage. In this respect the soil differs from Fullerton cherty silt loam, hilly phase. It normally is on ridge slopes in highly dissected uplands and is closely associated with Clarksville, Bolton, and Greendale soils and with other Fullerton soils. It developed under a deciduous forest, chiefly oaks and hickories.

Profile description:

0 to 8 inches, pale-brown to light yellowish-brown or yellowish-brown very friable silt loam; the upper 2 inches is stained dark by organic matter.
8 to 15 inches, mixed yellowish-brown or light yellowish-brown and reddish-yellow friable heavy silt loam to silty clay loam; weakly developed fine blocky structure.
15 to 23 inches, yellowish-red or reddish-yellow friable to firm silty clay loam; moderate to well-developed medium blocky structure.
23 to 38 inches, red or yellowish-red firm silty clay; well-developed medium to coarse blocky structure.
38 to 48 inches +, red to yellowish-red firm or very firm silty clay; contains irregular streaks of gray, yellow, and brown; bedrock at depths of 8 feet or more.

The soil is medium to strongly acid and moderate to low in organic matter and plant nutrients. It is permeable to roots, air, and moisture. The water-supplying capacity is moderate but, because of the strong slopes, surface runoff is rather rapid. Small angular chert fragments are common on the surface and throughout the profile, but they do not interfere will tillage or lower the productivity.

Use and suitability.—All of this soil lies beneath a forest that has been cut over many times.

Because of the rather steep slopes and danger of erosion, this soil is not well suited to tilled crops. If cleared for crops, it would require careful tillage and management, including proper selection and rotation of crops and proper fertilization. This soil is perhaps better suited to pasture and semipermanent hay crops. If amendments are used properly, excellent pasture should result. The soil is in management group 13.

Fullerton silt loam, eroded hilly phase (12 to 25 percent slopes) (Fl).—This well-drained soil of the limestone uplands has a light-colored surface soil and a yellowish-red subsoil. It differs from Fullerton silt loam, hilly phase, chiefly in being eroded. Much of the original surface soil has been lost. In a few places the top part of the subsoil has been mixed with the rest of the original surface soil. The plow layer therefore has a light reddish-yellow cast. In most places, however, the amount of subsoil that has been mixed with the surface layer is not enough to affect materially the texture or consistence. The soil is in widely scattered small areas throughout the valley section. It is associated with Greendale, Clarksville, Pace, and Bolton soils and with other Fullerton soils.

The surface layer is a light yellowish-brown or yellowish-brown friable heavy silt loam, 3 to 7 inches thick. The subsoil is a yellowish-red firm silty clay or silty clay loam.

Use and suitability.—All the soil is cleared. An estimated 15 percent is in corn, 10 percent in cotton, 5 percent in small grains, 20 percent in hay, 30 percent in pasture, and 5 percent in other crops. About 10 percent is idle.

Because of the rather steep slopes that are difficult to work, and the great hazard of erosion, this soil is not well suited to row crops. Continued use of the soil for tilled crops requires careful management, including the proper selection and rotation of crops, proper fertilization, and careful tillage. This soil is in management group 13.

Fullerton silt loam, eroded rolling phase (5 to 12 percent slopes) (Fh).—A light-colored surface soil and a yellowish-red subsoil characterize this well-drained soil of the limestone uplands. It differs from Fullerton silt loam, hilly phase, mainly by occupying milder slopes and in being eroded. Erosion has removed much of the original surface soil, including the thin layer of high organic-matter content. In a very few small spots, all of the surface soil has been lost and the yellowish-red subsoil is now exposed. The soil occupies narrow, winding ridge crests in the highly dissected uplands. The areas are small and irregular and are closely associated with Clarksville, Bolton, Greendale, Pace, and Minvale soils and with other Fullerton soils.

The present surface soil is a yellowish-brown to light yellowish-brown friable heavy silt loam. The subsoil is a yellowish-red to red firm silty clay or silty clay loam. The depth to limestone bedrock is ordinarily greater than 8 feet.

The soil is medium to strongly acid and is moderate to low in plant nutrients and organic matter. It is permeable to roots, air, and moisture. Rainfall is readily absorbed and well retained. The water-supplying capacity is moderate. Small angular chert fragments are scattered sparsely over the surface and in the soil layers, but they do not lower the productivity of the soil.

Use and suitability.—An estimated 15 percent of this soil is in corn, 10 percent in cotton, 10 percent in small grains, 30 percent in hay (mainly lespedeza), 30 percent in pasture (largely unimproved), and 5 percent in other crops, including tobacco and truck crops.

This soil is suited to most of the commonly grown crops. It appears especially well suited to the grasses and legumes, including alfalfa. Maintaining or increasing crop yields and conserving the soil require rotation of crops and adequate fertilization. The risk of erosion restricts the use of this soil for cultivated crops. Nevertheless, the soil probably can be conserved under a rotation that includes a row crop once every 3 or 4 years. This soil is in management group 9.

Fullerton cherty silt loam, hilly phase (12 to 25 percent slopes) (Fc).—This is a well-drained soil of the limestone uplands. It was derived from low-grade, or cherty, dolomitic limestone. It has developed under a predominantly deciduous forest consisting chiefly of oaks and hickories.

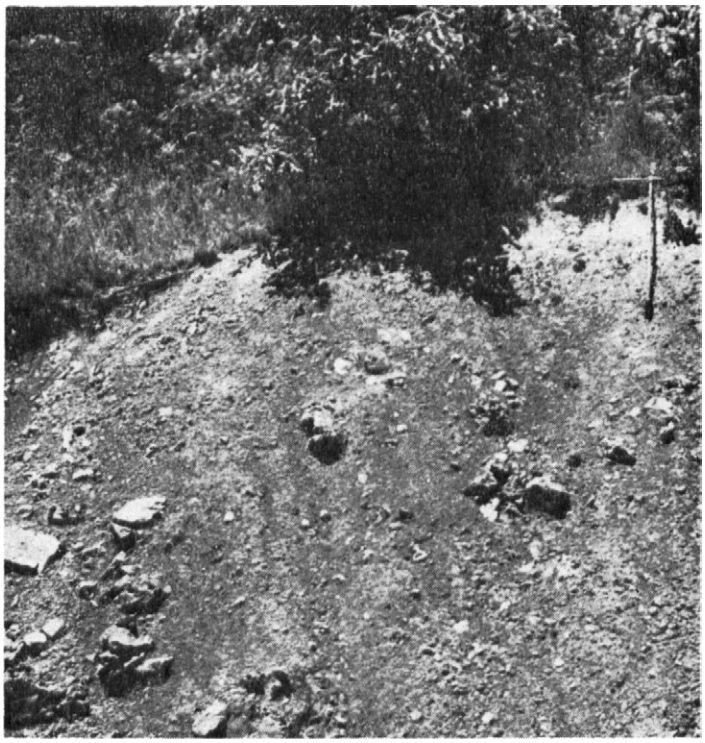

Figure 5.—Profile of Fullerton cherty silt loam.

The soil is on ridge slopes in highly dissected uplands and is closely associated with Clarksville, Bolton, Pace, Minvale, and Greendale soils and with other Fullerton soils. It is the most extensive of the Fullerton soils (fig. 5).

Profile description:

0 to 8 inches, very pale brown to light yellowish-brown cherty very friable silt loam.
8 to 15 inches, mingled light yellowish-brown and reddish-yellow friable cherty silt loam or cherty silty clay loam; weakly developed fine blocky structure.
15 to 23 inches, yellowish-red moderately firm cherty silty clay loam; moderately well developed medium blocky structure.
23 to 37 inches, red or yellowish-red moderately firm cherty silty clay; well-developed medium to coarse blocky structure.
37 to 48 inches +, red to yellowish-red firm cherty silty clay; contains irregular streaks of yellow, gray, and brown; splotches are usually more abundant in lower part of layer; bedrock at depths of 8 feet or more in most places.

The soil is low in organic matter and plant nutrients and is strongly to very strongly acid. It is permeable to air and roots. Surface runoff is medium, and internal drainage is rapid. The water-supplying capacity is low. Angular chert fragments are scattered over the surface and throughout the soil profile, and they interfere materially with tillage. The numerous chert fragments make the soil more porous and therefore lower its capacity to hold water and fertilizer.

Use and suitability.—All of this soil is now wooded. It has been cut over several times, and the trees are small to medium. Yields are low, and much of the timber is poor quality.

This soil is poor for tilled crops but fair for pasture. Because of chertiness and strong slopes, it is difficult to use plows or other heavy farm machinery. Fair pastures can be established and maintained, but low water-supplying capacity and low fertility will cause yields to be low in dry periods. Areas of the soil used for a livestock-general farming system could be used for pasture. Much of the soil is best used for forestry. This soil is in management group 13.

Fullerton cherty silt loam, eroded hilly phase (12 to 25 percent slopes) (Fd).—This is a well-drained soil of the limestone uplands. The surface soil is a pale-brown or light yellowish-brown friable cherty silt loam. The subsoil is yellowish-red or red firm cherty silty clay loam. The soil differs from Fullerton cherty silt loam, hilly phase, in being eroded. Part of the surface soil has been lost, and there has been some mixing of the surface soil with the subsoil in the plow layer. In a few small severely eroded spots the reddish subsoil is exposed.

Small to medium, irregularly shaped areas of this soil occur throughout the valley on the landscape known locally as "the ridge section." The soil is closely associated with the Clarksville, Bolton, Minvale, and Pace soils and with other Fullerton soils.

The soil is low in organic matter and plant nutrients and is strongly to very strongly acid. It is permeable enough for extensive root penetration and free circulation of air and moisture. Surface runoff is medium, internal drainage is rapid, and the water-supplying capacity is low. Chiefly because of the high content of chert, the soil is difficult to work and conserve.

Use and suitability.—All of this soil has been cleared, and most of it is idle or in unimproved pasture. The acreage in crops is very small, and it is in small units that are farmed separately or with adjoining soils.

Steepness of slope, chertiness, risk of erosion, and low content of plant nutrients limit the suitability of this soil for crops. The soil is difficult to till and moderately difficult to conserve. The use of farm machinery is greatly handicapped by the strong slopes and chertiness. A high level of management is necessary to maintain the soil if it is used for crops, but fair pastures could be established and maintained. Because the water-supplying capacity is low, pasture yields probably will be low in some seasons, even if the soil is properly fertilized. This soil is in management group 13.

Fullerton cherty silty clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Fg).—This soil of the uplands was derived from cherty limestone material. It is more severely eroded than the hilly phase of Fullerton cherty silt loam. Most of the original surface soil and, in places, a part of the subsoil have been lost. Shallow gullies are common, and a few cannot be crossed with farm machinery. This soil is largely in the Fullerton-Clarksville-Greendale soil association.

The present surface layer, mainly a mixture of the remnants of the original surface soil with subsoil material, varies within short distances from pale-brown cherty silt loam to yellowish-red cherty silty clay loam. The subsoil is yellowish-red or red cherty silty clay loam to cherty silty clay.

The soil is very low in organic matter, low or very low in plant nutrients, and strongly to very strongly acid. It is permeable to air and roots. The surface layer, however, is subject to clodding and baking, and it absorbs water slowly. Runoff is rapid or very rapid. The water-supplying capacity is very low. Chert on the surface and throughout the soil interferes greatly with tillage.

As mapped, this soil includes about 100 acres having less chert in the plow layer, and which are, therefore, easier to till.

Use and suitability.—All areas of this soil have been cleared, but most of them are now idle or in unimproved pasture. Some areas are reverting to poor-quality forest.

Strong slopes, chertiness, erodibility, low water-supplying capacity, and low plant-nutrient content limit the use of this soil. The soil is difficult to till and to conserve. Fair pastures can be established and maintained under a high level of management, but because of the very low water-holding capacity, pasture yields will be very low in dry seasons, even if the soil is properly fertilized. This soil is best used for forests. It is in management group 14.

Fullerton cherty silt loam, steep phase (25 to 60 percent slopes) (Fe).—This is a well-drained to excessively drained soil of the limestone uplands. Its surface soil is a pale-brown or very pale brown to light yellowish-brown, cherty, very friable silt loam. The subsoil is a yellowish-red to red, moderately firm, cherty silty clay or cherty silty clay loam.

The soil differs from the hilly phase of Fullerton cherty silt loam chiefly by occupying steeper slopes. The soil layers are somewhat thinner and the depth to bedrock is generally less.

Areas of this soil are medium to large and are within one major belt that runs roughly through the center of the valley.

A large quantity of small and large chert fragments, on the surface and scattered throughout the soil profile, interferes seriously with tillage. Tillage is hardly feasible anyway. Rock outcrops are common on a few of the steeper slopes.

The soil is readily permeable to roots, air, and moisture. The water-supplying capacity is very low. Surface runoff is rapid to very rapid, and internal drainage is rapid. The soil is low to very low in plant nutrients and strongly to very strongly acid.

Use and suitability.—All of this soil is in forest consisting of oaks and hickories and some beech, tulippoplar, and pine.

This soil is too steep for long-term growing of field crops, and furthermore, it is cherty, highly erodible, and rather easily depleted of virgin fertility. The soil is only moderately well suited to pasture, but if it is properly fertilized and seeded with a suitable pasture mixture, fair pastures can be established and maintained. Grazing should be carefully controlled. On most farms this soil is probably best suited to forest. Unless there is a definite need for additional pasture, a shift from forest to pasture seems unwise. This soil is in management group 18.

Fullerton cherty silt loam, eroded steep phase (25 to 60 percent slopes) (Ff).—This is a well-drained to excessively drained soil. It has formed from cherty limestone materials in small- to medium-size areas that are scattered widely throughout the cherty limestone uplands. Closely associated soils are the Clarksville and Bolton soils and other Fullerton soils.

The main differences between this soil and Fullerton cherty silt loam, hilly phase, result from the steeper slopes and erosion. Erosion has removed a moderate to an appreciable part of the original surface layers. Under cultivation, there has been some mixing of the surface and subsoil layers. The texture of the plow layer therefore varies.

The present surface soil consists of a pale-brown or light yellowish-brown very friable cherty silt loam. The subsoil is a yellowish-red or red moderately firm cherty silty clay loam.

The soil is low in organic matter and is strongly to very strongly acid. There are enough chert fragments scattered over the surface and through the soil to make tillage very difficult. The high content of chert makes the soil porous; therefore, internal drainage is rapid and the water-holding capacity is low.

Use and suitability.—All this soil has been used for general farm crops or pasture. At present, most of it is either idle or in unimproved pasture (fig. 6). Little, if any, is in cultivated crops. The present cover consists largely of broomsedge and other native grasses, weeds, briers, and vines, with some brush and small trees. On the more eroded sites, plant growth is sparse or the ground is nearly bare.

This soil is difficult to cultivate and to conserve. It is too steep for practical, efficient use of nearly all types of farm implements. The steep slopes, erosion, droughtiness, chertiness, and low fertility limit the use of the soil. Fair pastures can be had if they are properly fertilized and grazing is carefully controlled. On most farms forestry appears to be the best use of this soil. It is in management group 18.

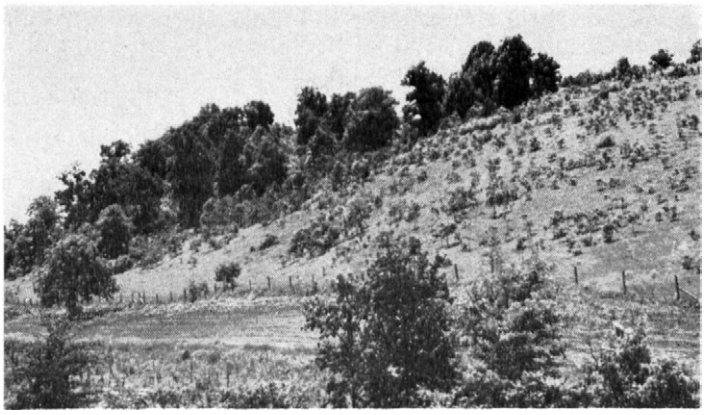

Figure 6.—**Unimproved pasture on Fullerton cherty silt loam, eroded steep phase. Greendale soils are along the foot slope.**

Fullerton cherty silt loam, rolling phase (4 to 12 percent slopes) (Fa).—A light-colored surface soil and a yellowish-red or red subsoil characterize this well-drained soil of the limestone uplands. The soil differs from Fullerton cherty silt loam, hilly phase, mainly in occupying milder slopes. It lies on narrow, winding ridge crests in association with Clarksville and Bolton soils and with other Fullerton soils.

The surface soil is a pale-brown or light yellowish-brown very friable cherty silt loam. The subsoil is a yellowish-red or red moderately firm cherty silty clay loam. The depth to cherty limestone bedrock is normally more than 5 feet.

The soil is strongly to very strongly acid and is low to very low in plant nutrients and organic matter. Rainfall is readily absorbed, but percolation is only moderately rapid, and the soil tends to be droughty. Angular chert fragments, scattered over the surface and throughout the profile, make the soil difficult to work. The porous nature of the soil causes leaching that is difficult to control.

Use and suitability.—All areas of the soil are in forest. The present stand is a cutover growth of mixed hardwoods varying in size, age, and quality.

The soil is suitable for many kinds of crops, including corn, small grains, cotton, lespedeza, and grasses. With proper liming and fertilization, red clover and alfalfa can be grown. The soil is moderately easy to till and conserve, although chertiness interferes with tillage. Many areas are small and isolated by large areas of soils not suitable for crops or pasture. These areas cannot be cropped efficiently and probably should be left in forest. This soil is in management group 9.

Fullerton cherty silt loam, eroded rolling phase (4 to 12 percent slopes) (Fb).—This is a well-drained soil of the limestone uplands. It differs from Fullerton cherty silt loam, hilly phase, chiefly by being eroded and in occupying milder slopes. Much of the original

surface layer, including the thin layer of higher organic-matter content, has been removed by erosion. In a few very small severely eroded spots the reddish subsoil is exposed.

The present surface layer is predominantly a yellowish-brown or pale-brown friable cherty silt loam. The subsoil is a yellowish-red moderately firm cherty silty clay loam or cherty silty clay. This soil is largely confined to the tops of long, narrow ridges and is closely associated with Clarksville and Bolton soils and with other Fullerton soils.

The soil is strongly acid and low or very low in plant nutrients and organic matter. It permits good aeration and root penetration. The water-supplying capacity is medium to low.

Use and suitability.—Almost all of this soil is used for general crops or pasture. Only a small acreage is idle land or wasteland. The main crops are corn, cotton, and lespedeza.

The soil is suited to many kinds of farm crops, although yields are moderately low under ordinary management. Corn, wheat, oats, barley, lespedeza, red clover, orchardgrass, alfalfa, and cotton can be grown successfully if amendments are properly used. The soil is moderately easy to work and to conserve, but the large amount of chert on the surface and in the plow layer hinders tillage appreciably. Response to improved management is moderately good, although somewhat limited by droughtiness. This soil is in management group 9.

Greendale silt loam (2 to 7 percent slopes) (Gb).—This is a moderately well drained to well drained soil of the young colluvial lands. It has formed from local alluvial or colluvial materials washed largely from the Fullerton soils. It is on gently sloping areas at the base of slopes from which the soil material has washed, and along narrow intermittent drainageways. The soil is in small areas widely distributed throughout the upland belt occupied by Fullerton and Clarksville soils. The vegetation consisted chiefly of deciduous forest.

Profile description:

0 to 15 inches, light yellowish-brown to pale-brown very friable silt loam.
15 to 36 inches, light yellowish-brown to brownish-yellow friable silt loam or silty clay loam, lightly splotched with yellow in the lower part.
36 inches +, brownish-yellow silty clay loam splotched with yellow and gray.

The depth of the accumulation ranges from 2 to 10 feet.

The soil is medium acid and is apparently moderately well supplied with organic matter and plant nutrients. Although the soil is virtually free of stone and chert, some areas have a few small chert fragments on the surface and through the soil mass, but not enough to interfere materially with tillage. The soil is readily permeable to roots, air, and moisture. Water is readily absorbed and well retained. The water-holding capacity is high. Surface runoff is medium to slow.

This soil varies somewhat from place to place because of differences in parent material, depth of accumulation, texture, and drainage.

As mapped, this separation includes soils on small alluvial-colluvial fans that formed where small streams deposited materials on the flood plains of larger streams.

Use and suitability.—An estimated 25 percent of this soil is in corn, 20 percent in small grains, 40 percent in hay and pasture, and 15 percent in other miscellaneous crops, including tobacco and vegetables.

Greendale silt loam is well suited to tilled crops and is capable of withstanding rather intensive use. It is not so well suited to alfalfa as some of the red soils, such as the Etowah and Cumberland. It has a very low susceptibility to erosion. Control of runoff or erosion is a minor problem, but one that cannot be entirely ignored.

The soil is moderately fertile and has a high water-holding capacity; consequently, yields of most crops are fairly high. It is somewhat lacking in lime, phosphorus, and nitrogen in most places. If these are added, the response will probably be good. With proper fertilization, yields probably can be maintained for long periods under continuous cropping. On most farms, however, it is better to use a short rotation that includes a legume crop, such as red clover. This is one of the better soils of the county for production of tobacco. It is in management group 2.

Greendale cherty silt loam (2 to 7 percent slopes) (Ga).—This is a well drained or moderately well drained soil of the young colluvial lands. The parent material is from uplands underlain by cherty limestone. The soil is on gently sloping alluvial-colluvial fans formed by small streams emerging onto the flood plains of larger streams, on narrow bottoms along deeply entrenched stream beds, or on narrow sloping areas at the foot of steep slopes. It is widely distributed in small areas throughout the cherty limestone belt in the upland. The soil has developed under a deciduous forest consisting chiefly of white oak, red oak, and hickory.

Profile description:

0 to 14 inches, grayish-brown to light yellowish-brown friable cherty silt loam.
14 to 36 inches brownish-yellow or light yellowish-brown friable cherty silt loam to light cherty silty clay loam.
36 inches +, brownish-yellow friable cherty silty clay loam; occasional gray splotches; chert fragments range from 1 to 3 inches in diameter.

The surface layer has enough chert to interfere materially with cultivation, and a small acreage is included where tillage is almost impossible. The soil is medium to strongly acid throughout. It has a moderately low supply of organic matter but contains more than the adjacent upland soils. The soil is very porous and freely permeable to air, roots, and water. It is moderate in water-holding capacity. External drainage is medium, and internal drainage is medium to rapid. The soil is moderately fertile, but there is not enough lime, nitrogen, and phosphorus, and possibly potassium. The soil is not likely to erode under good management. It is not difficult to work.

Use and suitability.—Practically all of this soil has been used for crops. An estimated 80 percent is now used for crops, and the rest is idle or in unimproved pasture. As the soil is generally in small, irregularly

shaped areas, it is usually put to the same use as the soil with which it is associated.

Greendale cherty silt loam is suitable for many kinds of crops. It is well suited to early vegetable crops but generally is not put to that use. The soil has a lower water-supplying capacity than Greendale silt loam, and where the soil is coarse textured, it may be somewhat droughty for corn. It is only moderately productive, but yields can be increased greatly by the proper use of amendments and crop rotations. The soil is well suited to pasture but it needs lime and phosphorus for good yields. It is in management group 2.

Gullied land, limestone soil materials (12 to 25 percent slopes) (Gc).—This land has deep gullies. The original surface soil and subsoil layers have been largely removed. The soil material now exposed consists chiefly of red or yellowish-red silty clay, although some remnants of the original soil profile remain between gullies. In many places limestone bedrock is exposed.

This land type is in small, widely separated areas. It does not occur in any particular soil association area, but most of it is in areas underlain by clayey limestone.

Use and suitability.—Practically all of this land type has been abandoned, although a few areas of it are in pasture. A few areas have been reforested, but much of it is covered with a sparse growth of cedar and scrub trees. This land type is unsuited to crops or pasture. In most places it should be reforested, although erosion often can be checked more quickly with kudzu. Considerable advance preparation is needed before trees can be planted. This land type is in management group 19.

Hamblen loam (0 to 2 percent slopes) (Ha).—This is an imperfectly drained soil of the bottom lands. It consists of mixed general alluvium washed mainly from uplands underlain by shale, quartzite, and sandstone. It differs from Staser loam chiefly in having poorer drainage. This soil occurs most extensively along the two Sequatchie rivers. It is in narrow, elongated, areas of small acreage that are closely associated with Prader, Sequatchie, and Staser soils.

Profile description:

0 to 14 inches, brown to yellowish-brown very friable loam.
14 to 30 inches, grayish-brown to yellowish-brown friable loam, splotched and mottled with olive gray and yellow.
30 inches +, moderately friable loam to sandy loam highly mottled with brown, yellow, and olive gray; alluvial deposit 3 to 10 feet or more in depth.

The soil is medium to slightly acid and appears to be moderately well supplied with organic matter and plant nutrients. The soil is very permeable when not saturated with water. Rainfall is readily absorbed and well retained. The water-holding capacity is fairly high. Both surface runoff and internal drainage are slow. The soil is on nearly level flood plains and practically all of it is subject to overflow. It is fairly free of stones or gravel.

As mapped, this separation includes a few small variations. Although most of it is imperfectly drained, some very small included areas are poorly drained, whereas others are well drained. A few areas contain a considerable amount of cobblestones and gravel. The texture ranges from silt loam to fine sandy loam.

Use and suitability.—Nearly all of this soil is cleared. It is used chiefly for growing corn, but is also used for hay and pasture. Crop yields are highly variable, but in general yields of corn and many forage crops are relatively high.

Chiefly because of the inferior drainage, this soil is not so well suited to crops as Staser loam. Corn frequently has to be planted later in the spring and is more likely to be injured by wetness. Hay and pasture plants moderately tolerant of wetness are about equally well suited to both soils.

Hamblen loam is especially valuable for pasture in some areas because it stays moist and productive through long dry periods. Drainage is generally not adequate for alfalfa. Although some small grains are grown, the soil is not considered well suited to them. Artificial drainage might broaden the use suitability of this soil. Lime ordinarily is not needed on this soil but often phosphorus and nitrogen should be added. This soil is in management group 1.

Hartsells fine sandy loam, undulating phase (2 to 5 percent slopes) (Hb).—This is a very strongly acid sandy soil of the uplands. It has formed from the weathered products of nearly level-bedded acid sandstone under a predominantly deciduous forest.

Medium and large areas are widely distributed over the Cumberland Plateau in close association with Muskingum, Linker, and Cotaco soils, and with other Hartsells soils.

Profile description:

0 to 9 inches, yellowish-brown to light yellowish-brown very friable fine sandy loam to loam; weak medium crumb structure; upper 1 to 2 inches stained dark with organic matter.
9 to 15 inches, yellowish-brown very friable light clay loam to sandy clay loam; weakly developed coarse crumb to very fine blocky structure.
15 to 32 inches, yellowish-brown to brownish-yellow very friable light clay loam or fine sandy clay; weak fine to medium blocky structure.
32 inches +, strong-brown to reddish-yellow friable fine sandy clay or sandy clay loam; weak medium blocky structure; sandstone bedrock is generally at depths of 3 to 5 feet.

A few white, rounded, quartz pebbles occur throughout the profile.

This soil is very strongly acid, low in organic matter, and very low in plant nutrients and natural fertility. It is very permeable to air, roots, and water. Its water-supplying capacity is about medium. Rainfall is readily absorbed and fairly well retained. Surface runoff is slow, and internal drainage is medium. Shallowness to bedrock often restricts the feeding zone of deep-rooted crops.

The soil varies mainly in depth to bedrock. The normal range is from 2 to 7 feet, but in a few places bedrock is near the surface. The texture varies from loam to fine sandy loam.

Use and suitability.—All of this soil lies beneath a badly cut over and burned over forest.

If cleared this soil would be well suited to all crops common to the area. It is easy to work and not difficult to conserve. It can be worked at a wide range

of moisture content, and the maintenance of good tilth is rather easy. Because of mild slopes and good permeability, surface runoff is slow and erosion control is not a serious problem. Therefore, this soil could be used in a short rotation. Fertilization is very necessary for satisfactory yields of practically all crops. The soil responds very well when amendments are applied. It is in management group 6.

Hartsells fine sandy loam, eroded undulating phase (2 to 5 percent slopes) (Hc).—This is a strongly acid sandy soil of the uplands. It has formed from the weathered products of almost level-bedded acid sandstone. It differs from Hartsells fine sandy loam, undulating phase, chiefly by being eroded.

This soil occupies large areas widely distributed over the Cumberland Plateau. Closely associated are Muskingum, Linker, and Cotaco soils and other Hartsells soils.

The soil has lost 25 to 50 percent of the original surface layer, including the thin top layer of higher organic-matter content. The present surface soil is a yellowish-brown very friable fine sandy loam to loam. The subsoil is a yellowish-brown to brownish-yellow or strong-brown friable light clay loam.

One of the outstanding characteristics of this soil and others of the Hartsells series is the indistinctness of the layers. Each layer grades into the layer below, and definite lines between soil horizons cannot be detected. Therefore, it is difficult to measure the depth of surface soil or estimate the amount lost through erosion.

Use and suitability.—All of this soil has been used for crops and pasture. At present, the chief crops are corn, vegetables, and pasture. Crop yields are generally low, and pastures are of low quality and unimproved. A large acreage is idle each year.

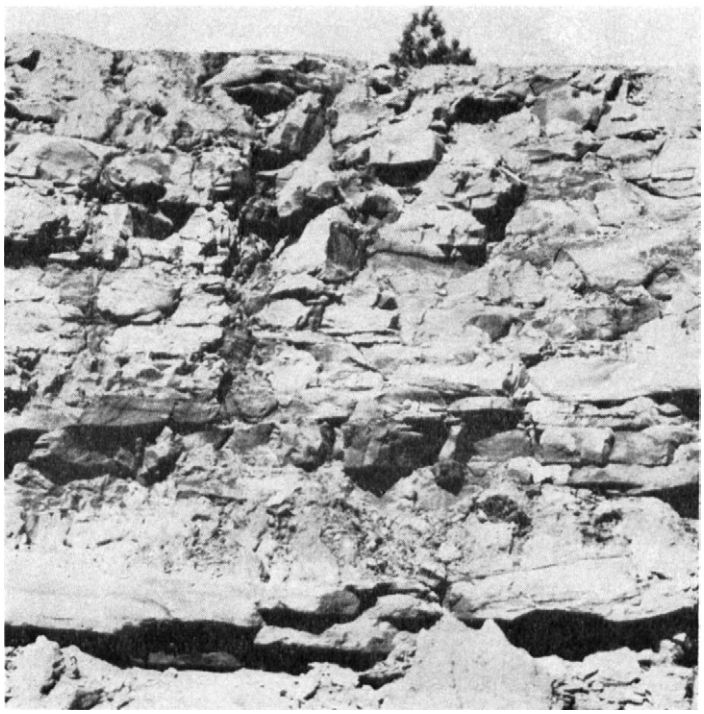

Figure 7.—**Level-bedded sandstone on the plateau; this sandstone is the parent rock of the Muskingum and Hartsells soils.**

The soil is well suited to all crops that grow satisfactorily in this climate. It is easy to work and easy to conserve and has excellent properties for the maintenance of good tilth. It can be worked over a fairly wide range of moisture content. Because of mild slopes and good permeability, surface runoff is slow and erosion control is not difficult. The soil therefore could be used in a rather short rotation, provided the soil is adequately fertilized and the crops in the rotation are properly selected. Fertilization is essential for satisfactory yields of practically all crops. The soil is particularly low in lime and phosphorus. Its response to amendments is excellent. It is in management group 6.

Hartsells fine sandy loam, rolling phase (5 to 12 percent) (Hd).—This is a very strongly acid sandy soil of the rolling uplands. It has developed from the weathered products of nearly level bedded acid sandstone under a predominantly deciduous forest (fig. 7).

Large areas are widely distributed over the Cumberland Plateau in close association with areas of Muskingum, Linker, and Cotaco soils, and other Hartsells soils. It is the most extensive of the Hartsells soils.

Profile description:

0 to 7 inches, yellowish-brown or light yellowish-brown very friable fine sandy loam to loam; weak medium crumb structure; top 1 to 2 inches stained dark with organic matter.

7 to 21 inches, brownish-yellow to yellowish-brown or strong-brown friable or very friable light clay loam or fine sandy clay; weak fine to medium blocky structure.

21 to 32 inches +, reddish-yellow to strong-brown friable fine sandy clay to sandy clay loam; weak medium blocky structure; layer rests on the sandstone bedrock, which is generally at depths of 2 to 5 feet.

This soil is very strongly acid, low in organic matter, and very low in plant nutrients and fertility. It is very permeable to roots, air, and moisture. Water is readily absorbed and fairly well retained. The water-supplying capacity is about medium. The soil would be easy to work and has excellent properties for maintenance of good tilth. It could be worked over a wide range of moisture content. Surface runoff and internal drainage are medium.

This soil varies mainly in depth to bedrock. For most of the acreage the depth probably ranges between 2 and 5 feet. Many spots are included, however, that are shallower to bedrock—1 to 2 feet—and, in a few places, the bedrock is exposed. It is difficult to map this soil accurately because it is covered with forest that has been badly burned over and cut over. It is estimated, however, that 10 to 20 percent of this soil has slopes of less than 5 percent. The areas having this milder slope are very small and would hardly affect the use of the soil as a whole. Also included are small areas and spots of the associated Linker and Crossville soils.

Use and suitability.—All of this soil is still forested. The stand is thin and of poor quality as a result of overcutting, burning, and low natural fertility of the soil.

This soil is well suited to crops and pasture. Practically all of the common field crops and pasture plants

could be grown successfully, but this soil is not so desirable for crops as the undulating phase of Hartsells fine sandy loam. This soil has stronger slopes, and erosion control would be difficult but necessary. Rotations will need to be of at least moderate length and include close-growing crops. In many places shallowness to bedrock restricts the feeding zone of some deep-rooted crops. Proper fertilization is very important, and the soil responds very well to it. The soil is easy to work and not hard to conserve. It is in management group 10.

Hartsells fine sandy loam, eroded rolling phase (5 to 12 percent slopes) (He).—This is a strongly acid sandy soil of the rolling uplands. It has formed from the weathered products of almost level-bedded acid sandstone. It differs from Hartsells fine sandy loam, rolling phase, chiefly by being eroded. The soil has lost from 25 to 75 percent of the original surface layer through erosion.

The present surface soil is a yellowish-brown to light yellowish-brown fine sandy loam to loam and, in places, a light clay loam. The subsoil is a brownish-yellow to strong-brown light clay loam to fine sandy clay. This layer rests on sandstone bedrock at a depth of 3 or 4 feet.

Medium-sized areas of this soil are widely scattered over the Cumberland Plateau. They are closely associated with areas of Muskingum, Linker, and Cotaco soils.

Use and suitability.—All of this soil has been used for pasture and crops. Most of it is now used for crops, principally corn, and the yields are generally low. About 30 percent is in unimproved pasture, and 15 percent is idle. Hay and some small grains are grown, but, for most of this area, farming is at a subsistence level.

This soil is moderately well suited to many field crops and is especially well suited to potatoes and many other vegetable crops. Fertilization is necessary for satisfactory yields of practically all crops, and lime is also essential to red clover and most legumes. A good response is expected from proper fertilization. Erosion and runoff can be controlled on this soil by using rotations of moderate length, combined with contour tillage. This soil is in management group 10.

Hermitage silt loam, eroded undulating phase (2 to 5 percent slopes) (Hf).—This is a brown well-drained soil of the old colluvial lands. It has formed from local alluvium or colluvium washed from uplands underlain by limestone. The materials have washed chiefly from the Cumberland, Waynesboro, and Bolton soils, and to a lesser extent from the Fullerton soils. The soil generally occupies foot slopes, colluvial fans, or benches immediately below the soil from which it has washed. The areas are mostly small and irregular in shape.

Profile description:

0 to 8 inches, brown or dark-brown friable silt loam; wooded areas have a thin surface layer stained dark with organic matter.
8 to 25 inches, strong-brown to yellowish-red moderately friable silty clay loam; weak medium blocky structure.
25 inches +, yellowish-red moderately firm silty clay loam or silty clay; medium blocky structure.

The depth of the colluvial deposit ranges from 3 to 10 feet or more.

This soil is medium to strongly acid, is high in plant nutrients, and appears to be well supplied with organic matter. It is permeable to roots, air, and moisture. Water is readily absorbed, and the water-holding capacity is high. Surface runoff is slow, and internal drainage is medium. This soil is virtually free of stones. Nevertheless, depending on the source of the materials, some areas have a few small chert fragments, and others have a few cobblestones.

Use and suitability.—Practically all areas of this soil have been cultivated. An estimated 60 percent is in crops, and 40 percent is in hay and pasture.

This soil is well suited to pasture and to practically all crops common to the area, including tobacco, alfalfa, and market vegetables. Although the soil is fertile, crops respond well to fertilizers and lime. Tilth and moisture conditions are favorable, and high yields can be consistently produced if the supply of plant nutrients, lime, and organic matter is maintained at a high level. Addition of lime, phosphorus, and possibly potassium will assure continued high yields of most crops. The soil is only slightly susceptible to erosion, so if management is good it can be maintained by using crop rotations of short or moderate length. This soil is in management group 4.

Hermitage silt loam, eroded rolling phase (5 to 12 percent slopes) (Hg).—This is a brown well-drained soil of the old colluvial lands. It has formed from materials that washed from soils underlain by limestone. It differs from Hermitage silt loam, eroded undulating phase, in having stronger slopes and in being slightly more eroded. A considerable part of the original surface layer has been lost through erosion, and in many places plowing has mixed the remaining part with the upper subsoil. Erosion losses have been uneven, however, and in most places the plow layer is entirely within the original surface layer. A few small severely eroded spots are conspicuous because the reddish subsoil is exposed.

The present surface layer is brown to reddish-brown silt loam to silty clay loam. The subsoil is a yellowish-red to strong-brown moderately friable silty clay loam or silty clay.

Use and suitability.—All of this soil is now used for many different crops and for pasture. It is well suited to practically all crops commonly grown, including tobacco, truck crops, and alfalfa.

Additions of lime and fertilizer are necessary to maintain or increase the yields of practically all crops. Phosphorus and nitrogen are needed for continuous high yields of all crops except legumes and the crops immediately following them. Potassium may be required for many crops, especially deep-rooted legumes such as alfalfa. The soil is moderately susceptible to erosion. A crop rotation of medium length that includes grasses and legumes is desirable as a general conservation measure. This soil is in management group 9.

Hollywood silty clay loam (2 to 7 percent slopes) (Hh).—This is an imperfectly or moderately well drained soil of the colluvial lands. It has formed from materials washed from uplands underlain by

clayey limestone. The soil is underlain practically everywhere by limestone at depths of 4 feet or more. It has developed under a predominantly deciduous forest vegetation that included many water-tolerant species.

The soil is normally at the bases of the stony and rocky limestone slopes from which it was washed. The areas, small and widely separated, are principally in or near mountain coves at the base of the steep mountains. The soil is closely associated with Swaim soils; Stony hilly and rolling land, limestone; and Rockland, limestone.

Profile description:

0 to 5 inches, light brownish-gray to grayish-brown firm or cloddy silty clay loam.
5 to 21 inches, dark gray to very dark gray extremely firm silty clay; very coarse blocky or massive structure; extremely hard when dry.
21 to 48 inches +, dark gray to very dark gray or dark olive-gray extremely firm silty clay mottled with yellow and reddish yellow; structureless or massive; extremely hard when dry and plastic when wet.

This soil is neutral to slightly acid, high in organic matter, and moderately well supplied with plant nutrients. Surface runoff is slow and internal drainage is slow or very slow. The soil has a fairly high water-holding capacity, but its water-supplying capacity is only moderate. The soil is only slightly permeable to air and roots. When it dries it becomes very hard and develops large cracks. Good tilth is difficult to maintain. The soil has a heavy texture. It can be worked within only a narrow range of moisture content.

Use and suitability.—Practically all of this soil has been used for crops and pasture. An estimated 60 percent is now in pasture, which generally is unimproved. The rest is used mainly for corn, small grains, crimson clover, soybeans, and vetch. About 10 to 15 percent is idle each year.

Because of poor tilth, impeded internal drainage, and fairly low water-supplying capacity, this soil is only moderately well suited to row crops. Its heavy texture makes it extremely difficult to work. Even under a high level of management, yields of such crops as alfalfa and tobacco are unsatisfactory. This soil is better suited to small grains, crimson clover, and other early maturing crops than it is to corn or other late-maturing crops. It is better suited to grain sorghum (locally known as *maize*) than to corn. The soil is well suited to practically all the pasture plants and semipermanent hay crops. It becomes droughty during long dry periods, but its droughtiness could be reduced by growing a dense cover, such as a grass-clover mixture. This soil is in management group 7.

Huntington silt loam (0 to 2 percent slopes) (Hm).—This is a brown well-drained highly productive soil of the first bottoms. It occupies long narrow strips on the nearly level flood plains of the Tennessee River. It occurs in close association with other Huntington soils and with Lindside, Melvin, and Wolftever soils. The recent alluvium from which the soil has formed is highly mixed. It has washed chiefly from uplands underlain by moderately high-grade limestone. The soil has formed under a forest of red oak, white oak, hickory, elm, beech, maple, ash, and sycamore.

Profile description:

0 to 12 inches, dark-brown or dark grayish-brown friable silt loam; 6 to 18 inches thick.
12 to 30 inches, brown or dark-brown friable heavy silt loam or silty clay loam; 10 to 30 inches thick.
30 inches +, dark yellowish-brown to dark-brown friable silt loam, in some places splotched with gray; interbedded with sandy material in places; 2 to 20 feet thick.

This soil is slightly acid to neutral, high in organic matter and plant nutrients, and high in water-supplying capacity. It is permeable to air, roots, and water. Surface runoff is very slow or slow, and internal drainage is medium. This soil is sometimes flooded.

Use and suitability.—All of this soil is used intensively for crops (fig. 8). Corn, the chief crop is

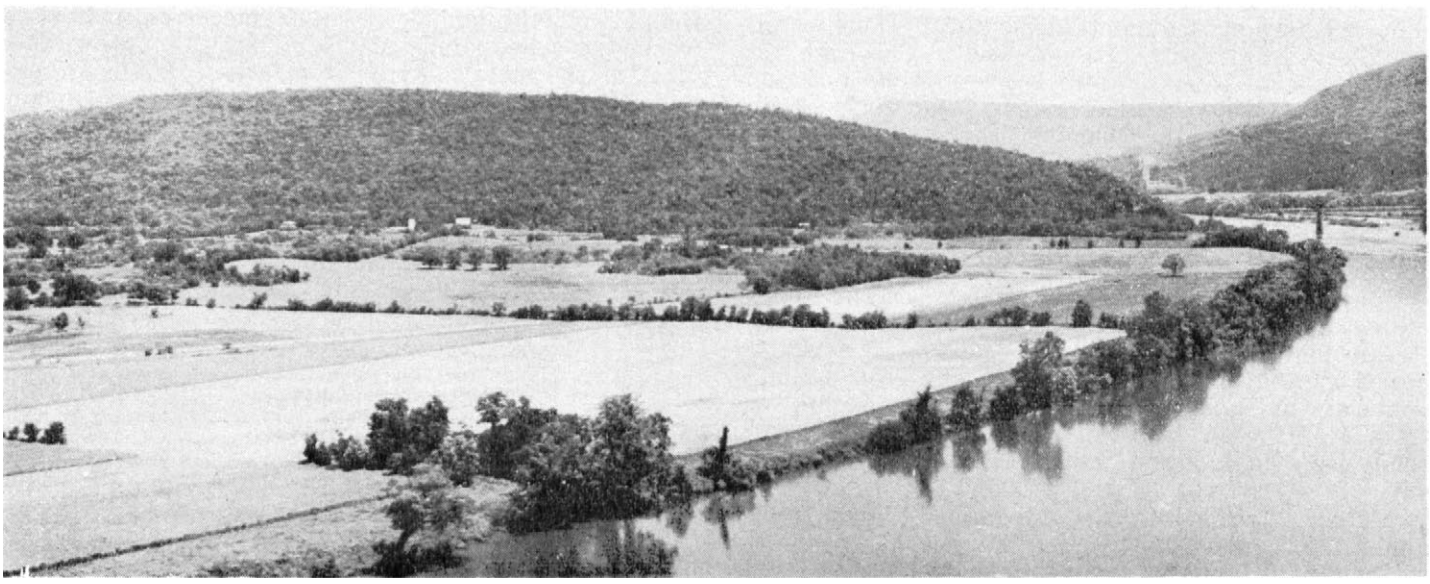

Figure 8.—**Intensively farmed areas of Huntington silt loam along the Tennessee River.**

grown almost continuously on most of the areas. The soil is also well suited to other summer annual crops.

This is the most fertile and probably the most productive of all of the soils in the county. The high natural fertility, which is increased almost every year by the deposit of sediments, makes it possible for crops to produce large yields year after year. Susceptibility to flooding limits use to some extent. This soil is in management group 1.

Huntington loam (0 to 2 percent slopes) (Hl).—This soil differs from Huntington silt loam chiefly in being sandy throughout. It is a brown, well-drained, highly productive soil of the first bottoms. The mixed recent alluvium from which it formed has washed chiefly from uplands underlain by limestone. The soil is young. The soil materials have not been in place long enough for a development of a well-defined surface soil and subsoil.

The soil occupies long narrow strips on the nearly level flood plains of the Tennessee River. It is closely associated with other Huntington soils and with Lindside, Melvin, and Wolftever soils. It has formed under a cover of deciduous forest.

Profile description:

0 to 12 inches, dark-brown to light-brown or grayish-brown very friable loam.
12 to 30 inches, brown to light-brown friable loam to clay loam.
30 inches +, light-brown to dark yellowish-brown moderately friable loam, splotched with gray; contains an appreciable amount of sand in most places.

Huntington loam is slightly to medium acid throughout. It is apparently high in organic matter, plant nutrients, and water-supplying capacity. It is very permeable to air, roots, and water. Surface runoff is slow, but internal drainage is medium.

Use and suitability.—Nearly all of this soil is used for crops. About 70 to 80 percent is in corn, which, on most areas, is grown year after year. Most of the rest is in annual hay. Little of this soil is ever idle.

The high natural fertility of the soil is increased almost yearly by sediments deposited by floodwaters. Fertilizers are rarely, if ever, used. The high fertility has made it possible for crops to produce reasonably large yields year after year. Many forage crops are suited to this soil. On the less productive areas, they are rotated with corn. The soil is easy to work and to conserve, but floods somewhat limit its suitability. Management practices should be chiefly concerned with selecting higher yielding varieties for seeding. This soil is in management group 1.

Huntington fine sandy loam (0 to 2 percent slopes) (Hk).—This is a brown well-drained sandy soil of the stream bottoms. The parent material consists of mixed general alluvium washed chiefly from uplands underlain by sandstone or limestone. The soil differs from Huntington silt loam chiefly in having a fine sandy loam surface soil and in being sandier throughout.

The areas occur on nearly level flood plains, chiefly along the Tennessee River. The soil is closely associated with Lindside, Sequatchie, and Wolftever soils and with other Huntington soils. It was formed under a deciduous forest.

Profile description:

0 to 10 inches, grayish-brown to dark-brown very friable fine sandy loam.
10 to 24 inches, yellowish-brown to dark-brown, friable heavy loam, silt loam, or fine sandy loam.
24 inches +, light-brown to yellowish-brown friable sandy loam to silt loam or silty clay loam, splotched with gray below about 36 inches.

This soil is slightly acid in most places, but some areas are medium acid. Its content of organic matter and most plant nutrients appears to be moderately high. The soil is permeable to roots, air, and moisture. Water is readily absorbed and fairly well retained. Surface runoff is slow, but internal drainage is medium to rapid. Most areas are flooded at times. Some gravel and cobblestones are on the surface and throughout the profile. They generally do not interfere with tillage. The soil is easily worked and can be tilled within a wide range of moisture content. Some areas are included that have a sandy loam surface layer.

Use and suitability.—Practically all of this soil has been cultivated. It is used chiefly, and in many places continuously, for corn. Some hay is grown, and a small acreage is in small grains and market vegetables. Fertilizers ordinarily are used only for vegetables.

This soil is well suited to intensive use, but the susceptibility to flooding restricts its use. Floods help to maintain the fertility, however, by depositing materials high in organic matter and plant nutrients. The soil is well suited to corn and to many hay crops. Small grains tend to lodge, to mature late, and to be susceptible to disease. Although the productivity is fairly high, yields would increase if phosphorus and nitrogen were applied and a short rotation were used that includes a legume. This soil is in management group 1.

Jefferson fine sandy loam, rolling phase (5 to 12 percent slopes) (Ja).—This is a well-drained friable soil of the old colluvial lands. It has formed from materials washed or rolled from uplands underlain by sandstone. Most of the materials are from areas of Muskingum and Hartsells soils. This soil occurs in areas of medium size that are widely distributed over the Cumberland Plateau. It occurs in benchlike positions, mainly at the bases of steep slopes occupied by Muskingum soils. A small acreage occurs in the valley at the bases of steep mountains. This soil is closely associated with soils of the Muskingum, Hartsells, and Linker series and with other Jefferson soils.

Profile description:

0 to 8 inches, light yellowish-brown to yellowish-brown very friable fine sandy loam; has a thin topmost layer stained dark with organic matter.
8 to 18 inches, brownish-yellow very friable fine sandy loam or loam; weak fine blocky structure.
18 to 34 inches, brownish-yellow or reddish-yellow very friable clay loam or sandy clay loam; weak fine blocky structure.
34 inches +, brownish-yellow or reddish-yellow friable clay loam or sandy clay splotched with yellow, pale yellow, and yellowish red.

The depth of this accumulation ranges from 3 to 10 feet.

The soil is strongly acid and low in organic matter and plant nutrients. It is very permeable to roots, air, and moisture. Rainfall is readily absorbed, and the water-holding capacity is about medium. A few small sandstone fragments are scattered over the surface and throughout the soil, but they are not so numerous as to interfere with tillage. The soil is easy to work and is not difficult to conserve.

About 30 acres is included in which stones are numerous enough in the plow layer to interfere materially with tillage.

Use and suitability.—All of this soil is still under forest. The stand is thin and of poor quality as a result of overcutting, burning, and low natural fertility of the soil.

This soil is well suited to all the commonly grown crops and pasture plants. It is seriously lacking, however, in lime, phosphorus, nitrogen, and potassium. Although its natural fertility is low, its response to soil amendments and good management is excellent. The soil is easy to work, and good tilth is easy to maintain. It is not highly susceptible to erosion. A short rotation can be used if other management practices are good. This soil is in management group 10.

Jefferson fine sandy loam, eroded rolling phase (5 to 12 percent slopes) (Jb).—This is a well-drained friable soil of the old colluvial lands. It differs from Jefferson fine sandy loam, rolling phase, chiefly in having lost much of the surface soil through erosion. Plowing is generally within the original surface layer in most places, but there has been some mixing with the subsoil in small spots.

The present surface layer is a light yellowish-brown to yellowish-brown very friable fine sandy loam, and the subsoil is a brownish-yellow or reddish-yellow friable clay loam to fine sandy clay loam.

The soil occurs on rolling areas of alluvial-colluvial material, at lower elevations, but next to areas of hilly or steep Muskingum soils. It is closely associated with Muskingum and Hartsells soils and with other Jefferson soils.

Use and suitability.—All areas of this soil have been cultivated. About 20 percent is now used for corn, 10 percent for small grains, 25 percent for hay, and 30 percent for pasture. About 15 percent is used for other crops or is idle.

The soil is moderately well suited to crops and pasture, but its slopes and low natural fertility greatly limit its usefulness. It is low in the major plant nutrients. Fertilizer is necessary for good yields of most crops. Applications of lime and fertilizer must be heavy to maintain stands of red clover and comparable crops. The soil is moderately susceptible to erosion, and some special effort is required to control surface runoff. This soil is in management group 10.

Lindside silt loam (0 to 2 percent slopes) (La).—This imperfectly drained soil occurs in depressed first bottoms. It consists of mixed recent alluvium that washed chiefly from uplands underlain by limestone. In drainage and associated characteristics, the soil is about halfway between the well-drained Huntington and the poorly drained Melvin soils. The soil occupies long, narrow areas, chiefly along the Tennessee River. It is associated with Huntington, Melvin, and Wolftever soils.

Profile description:

0 to 14 inches, brown to grayish-brown friable silt loam; 10 to 18 inches thick.
14 to 24 inches, brown to grayish-brown or dark yellowish-brown friable heavy silt loam, splotched with gray and strong brown; 8 to 20 inches thick.
24 inches +, mottled gray, yellow, and brown moderately friable heavy silt loam or silty clay loam; 5 feet or more thick.

The soil is medium to slightly acid and moderately high in plant nutrients and organic matter. Its water-supplying capacity is high. The soil is permeable throughout, but the lower layers are saturated with water and poorly aerated much of the time. Surface runoff is very slow, and internal drainage is moderately slow.

Some areas that have a silty clay loam surface soil are included in this mapping unit. Also included are some small poorly drained areas that are gray all the way to the top of the surface soil.

Use and suitability.—All areas of Lindside silt loam have been used intensively for crops and pasture. Corn is now the most extensive crop.

The use suitability of this soil is greatly limited by the imperfect drainage and susceptibility to flooding. The soil is well suited to corn, however, and to many of the summer annual hay crops. Fertilizer is not generally needed for moderately high yields because the sediments that have been deposited have replenished the organic matter and plant nutrients. Artificial drainage would probably not increase the use suitability greatly, because the soil could not be protected from flooding. Drainage might help to increase the average yields. This soil is in management group 1.

Linker loam, rolling phase (5 to 12 percent slopes) (Lb).—This is a friable well-drained soil of the rolling uplands. It has developed from the weathered products of a thick-bedded conglomerate or of almost level-bedded acid sandstone. It differs from the Hartsells soils in having a reddish subsoil and less sand in the profile.

Areas of this soil are medium or large. They are scattered widely over the Cumberland Plateau. Many areas occur between Sequatchie and Tracy City. This soil is associated with Muskingum, Hartsells, and Cotaco soils. The native vegetation was mainly deciduous forest.

Profile description:

0 to 8 inches, light yellowish-brown or yellowish-brown very friable loam; the topmost 2 inches stained dark with organic matter.
8 to 18 inches, strong-brown friable clay loam; fine blocky structure.
18 to 25 inches, yellowish-red friable fine sandy clay to clay loam; moderately developed medium blocky structure.
25 to 44 inches +, red or yellowish-red friable fine sandy clay; medium blocky structure; sandstone bedrock generally at depths of 4 to 6 feet.

The soil is strongly acid and low in organic matter and plant nutrients. It is very permeable to roots, air, and moisture. Surface runoff and internal drainage are moderate. Water is readily absorbed and

well retained, and the water-supplying capacity is medium to high. This soil is almost free of stones.

Use and suitability.—All of this soil is in forest that has been cut over or burned over. The timber is thin and of rather poor quality.

The soil is well suited to all the crops commonly grown. It is easy to work and to keep in good tilth. Because the slopes are mild, surface runoff is rather slow and erosion control is not difficult. The soil will erode, however, if left bare for long periods. Therefore, rotations are necessary and should be of at least medium length. Proper fertilization is required for most crops to yield satisfactorily. The soil is particularly low in lime and phosphorus, but its response to amendments is excellent. With adequate fertilizer and lime, this soil should be well suited to alfalfa and red clover. It is management group 10.

Linker loam, eroded rolling phase (5 to 12 percent slopes) (Lc).—This is a friable well-drained soil of the rolling uplands. It differs from Linker loam, rolling phase, mainly in having lost 25 to 75 percent of the surface soil through erosion. Small and medium-sized areas are widely scattered over the Cumberland Plateau, but most of them occur on a formation roughly paralleling the Sequatchie-Tracy City road.

The present surface soil, which in places is mixed with the uppermost part of the subsoil, is a yellowish-red or red fine sandy clay to clay loam. Acid sandstone bedrock generally occurs at depths of 3 to 6 feet.

Use and suitability.—All of this soil has been used for crops and pasture. It is now used mainly for corn, small grains, crimson clover, truck crops, and unimproved pasture. From 10 to 15 percent is idle each year.

This soil is well suited to practically all of the crops commonly grown in the county. It is easy to work, and water is easy to control. Nevertheless, at least medium-length rotations that include some close-growing crops will be needed to prevent erosion. The soil apparently is low or very low in all the essential plant nutrients. It responds well, however, to applications of fertilizer. If the fertility level is raised, such exacting crops as alfalfa and red clover can be grown successfully. This soil is in management group 10.

Melvin silty clay loam (0 to 2 percent slopes) (Ma).—This is a poorly drained gray soil of the bottom lands. It occurs on long, narrow depressions or sloughlike areas on the flood plain of the Tennessee River and along some of the larger creeks throughout the county. It has formed from recent alluvium that washed from uplands underlain mainly by limestone. The part along the creeks was derived from alluvium washed largely from cherty and clayey limestone. The soil is associated with Huntington, Lindside, and Wolftever soils. The native forest under which it developed consisted largely of water-tolerant trees such as willow, willow oak, sweetgum, and sycamore.

Profile description:

0 to 8 inches, gray to grayish-brown friable to firm silty clay loam splotched in a few places with strong brown; 6 to 10 inches thick.
8 to 28 inches, light-gray firm or very firm silty clay loam or silty clay splotched with strong brown; contains a few dark-colored concretions; 16 to 22 inches thick.
28 inches +, light-gray somewhat compact or massive silty clay or silty clay loam mottled with gray and strong brown; 3 to 10 feet thick.

The surface soil is slightly acid to alkaline, but the subsoil is medium to slightly acid. The soil is moderately well supplied with organic matter and plant nutrients and has a very high water-supplying capacity. Plant roots are generally confined to the upper part of the profile, as the lower part is saturated with water and poorly aerated most of the time. Surface runoff and internal drainage are very slow.

Use and suitability.—An estimated 25 percent of this soil is still under forest, and many of the forested areas are used as woodland pasture. The cleared areas are chiefly in unimproved pasture, but some are in crops, mainly corn.

This soil is fairly well suited to soybeans and to many pasture plants, such as Ladino clover, alsike clover, white clover, lespedeza, redtop, and fescue. Poor drainage makes it unsuitable for tilled crops. It appears that artificial drainage would make it moderately productive of corn, sorghums, and some hay crops, but drainage may not be feasible. After drainage, suitability of the soil would still be limited by the susceptibility to flooding. The soil is in management group 16.

Minvale cherty silt loam, eroded rolling phase (5 to 12 percent slopes) (Mb).—This is a well-drained soil on old colluvial foot slopes. The parent material has washed or rolled mainly from areas of Fullerton and Clarksville soils. This soil has developed under a hardwood forest of oak and hickory mixed with tulippopular, maple, beech, sweetgum, and walnut.

Closely associated with this soil are Fullerton, Clarksville, and Bolton soils of the uplands; Pace, Hermitage, and Greendale soils of the colluvial lands; and Lindside and Melvin soils of the bottom lands. Areas of this soil are small and widely distributed throughout the cherty limestone belt of the upland.

Profile description:

0 to 7 inches, grayish-brown to pale-brown very friable cherty silt loam.
7 to 16 inches, yellowish-brown to brownish-yellow friable heavy cherty silt loam.
16 to 30 inches, reddish-yellow to yellowish-red friable cherty silty clay loam; moderate medium blocky structure.
30 to 48 inches +, reddish-yellow or yellowish-red friable cherty silty clay loam, splotched and streaked with yellow and brownish yellow.

This soil is about medium in water-supplying capacity and in content of organic matter and plant nutrients. It is medium to strongly acid. It is readily permeable to air, roots, and water. Surface runoff is slow, and internal drainage is medium. Both small and large angular chert fragments are scattered over the surface and throughout the profile. These somewhat interfere with tillage, but they do not prevent it.

Use and suitability.—Nearly all this soil is rather intensively cropped. It is well suited to all the crops commonly grown. Amendments are necessary, however, for the successful growth of alfalfa and red clover and for continued high yields of all crops. The

soil is moderately easy to work and conserve. It is a responsive soil, and high yields of crops and pasture can be maintained if it is well managed. Because of the mild slopes, most farm machinery can be used on this soil, although the fields are small. This soil is in management group 9.

Minvale silt loam, eroded undulating phase (2 to 5 percent slopes) (Mc).—This is a well-drained soil of the colluvial lands. It has a light-colored surface soil and a yellowish-red subsoil. The parent material has washed or rolled mainly from areas of Fullerton soils. This soil normally occupies foot slopes, fans and benchlike positions immediately below the upland slopes from which its parent materials were washed. It is closely associated with Pace, Hermitage, and Greendale soils of the colluvial lands; Fullerton, Clarksville, and Bolton soils of the uplands; and Lindside and Melvin soils of the bottom lands. Areas of this soil are small and irregular in shape. They are widely distributed throughout the cherty limestone belt in the upland, chiefly along the rims of the limestone formation. The soil has developed under a hardwood forest consisting of oak and hickory mixed with tulip-poplar, maple, beech, sweetgum, and walnut.

Profile description:

0 to 8 inches, pale-brown friable silt loam; in wooded areas the upper 2 inches is stained dark with organic matter.
8 to 16 inches, mingled reddish-yellow and pale-brown friable heavy silt loam; yellowish brown to brownish yellow when crushed.
16 to 29 inches, yellowish-red friable to firm silty clay loam; moderately well developed medium blocky structure.
29 to 48 inches +, yellowish-red or reddish-yellow firm to moderately friable silty clay loam or silty clay, streaked or splotched with yellow and brownish yellow; medium blocky structure.

The soil is medium to strongly acid. It is about medium in content of organic matter and plant nutrients. The water-supplying capacity is medium to high. The soil is readily permeable to air, roots, and water. Water is readily absorbed and well retained. Surface runoff is slow, and internal drainage is medium. The soil is nearly free of stones.

A few areas have been included that differ from the typical soil in having a rather large number of fine chert fragments scattered over the surface and throughout the profile. Also, a small acreage of uneroded soil has been included. The included areas were too small to be shown separately on a map of the scale used.

Use and suitability.—Practically all of Minvale silt loam, eroded undulating phase, can be used rather intensively for field crops and pasture. Little of it is idle.

Many different crops, including all that are now commonly grown, can be produced successfully. Because of the slow surface runoff, the soil is easy to conserve, and short rotations can be used. The soil is easy to work. Its mild slopes make it possible to use most farm machinery, though fields are small. The soil is responsive to good management. High yields can be maintained under good management that includes adequate use of fertilizer. This soil is in management group 4.

Minvale silt loam, eroded rolling phase (5 to 12 percent slopes) (Md).—This is a well-drained soil of the rolling colluvial lands. It differs from Minvale silt loam, eroded undulating phase, mainly in occupying stronger slopes. Consequently, it is slightly more eroded. It occupies irregular areas of small or medium size. These are distributed widely along the foothills of the Fullerton and Clarksville ridges.

The present surface soil is a pale-brown to yellowish-brown heavy silt loam about 3 to 7 inches thick. In places it is mixed with the uppermost part of the subsoil. The subsoil is yellowish-red moderately friable silty clay loam to silty clay. The colluvial deposit is normally more than 5 feet thick. Limestone underlies it practically everywhere.

The soil is medium to strongly acid. It is moderately low in organic matter and plant nutrients.

Areas totaling about 30 acres that are not eroded are included with this mapping unit. Also included are areas that have profiles transitional to those of associated soils.

Use and suitability.—Minvale silt loam, eroded rolling phase, is used for pasture or crops. Little is idle. Nearly all crops common in the county are grown successfully, including alfalfa, tobacco, cotton, and market vegetables.

The soil is susceptible to erosion and is not so well suited to intensive use as Minvale silt loam, eroded undulating phase. Rotations will need to be longer and should include more close-growing crops. Tilth is generally good and is easy to maintain. The soil can be tilled safely within a wide range of moisture content. It is easy to work and to conserve. It needs amendments, and its response to them is excellent. This soil is in management group 9.

Muskingum stony fine sandy loam, steep phase (25 to 60 percent slopes) (Mg).—This shallow, light-colored, excessively drained, stony soil occurs on steep mountain slopes. It has developed from materials weathered from nearly level bedded acid sandstone. The characteristics of the soil material are highly variable because of the variable nature of the parent rock.

The soil is widely distributed over the Cumberland Plateau, but much of the acreage is on Walden Ridge. The areas are large, and the soil is one of the most extensive of the Muskingum series. Leaf mold covers the surface to a depth of about 1 inch. The underlying soil material consists of a light yellowish-brown to brownish-yellow very friable stony fine sandy loam. Bedrock generally occurs at depths of about 10 to 15 inches, but in some places it occurs at depths of as much as 3 feet.

The soil is strongly acid throughout, and its content of plant nutrients and organic matter is low. Many sandstone fragments, 2 to 10 inches across, are scattered on the surface and throughout the profile. Bedrock outcrops are common. The soil is very permeable to air, roots, and water. Surface runoff is very rapid, and internal drainage is rapid. The water-holding capacity is very low.

Use and suitability.—All of this soil is still under forest. Because of steepness, stoniness, and shallow depth, it is best left in forest. This soil is in management group 19.

Muskingum stony fine sandy loam, hilly phase (12 to 25 percent slopes) (Mf).—This is a light-colored, excessively drained upland soil of the Cumberland Plateau. It is shallow and stony. It has formed from materials weathered from nearly level bedded acid sandstone. This soil differs from Muskingum stony fine sandy loam, steep phase, chiefly in having milder slopes. In general, it is also somewhat deeper, slightly less stony, and has fewer bedrock outcrops. This soil occupies small areas that are widely scattered over the Cumberland Plateau. It occurs chiefly along deep V-shaped drainageways, but a little is on foot slopes.

The surface soil is a light yellowish-brown very friable stony fine sandy loam. The subsoil is a brownish-yellow to pale-yellow very friable stony loam or stony sandy clay loam. Bedrock occurs at depths of 1 to 2 feet in most places. A small acreage is included that differs in having lost a considerable part of the original surface layer through erosion.

Use and suitability.—Muskingum stony fine sandy loam, hilly phase, is still nearly all under forest. A few areas have been cleared and are in unimproved pasture, but some are reverting to forest.

This soil is unsuitable for crops or pasture because of its stoniness, strong slopes, and low fertility, and because it is inaccessible. It is in management group 15.

Muskingum stony fine sandy loam, rolling phase (5 to 12 percent slopes) (Me).—This is a light-colored excessively drained shallow upland soil of the Cumberland Plateau. The soil has formed from the weathered products of nearly level bedded acid sandstone. It occurs on slopes, chiefly at the heads of drainageways and on narrow interstream divides. The native vegetation was a deciduous forest consisting mainly of oaks.

Profile description:

0 to 7 inches, pale-brown to yellowish-brown very friable stony fine sandy loam, low in organic matter; in wooded areas organic matter has stained the top 1 or 2 inches a dark grayish brown.
7 to 18 inches, brownish-yellow to yellowish-brown very friable stony fine sandy clay loam or stony fine sandy loam; weak medium blocky structure.
18 inches +, very stony sandstone residuum or sandstone bedrock.

Sandstone fragments occur on the surface and throughout the profile, and a few rounded white quartz pebbles are scattered throughout the soil; bedrock outcrops are common.

The soil is strongly to very strongly acid and apparently low in organic matter and plant nutrients. Surface runoff is medium, and internal drainage is rapid. The soil is very permeable to roots, air, and water. The water-supplying capacity is low. This soil is difficult to work because of the stones and rock outcrops, but it can be worked throughout a wide range of moisture content.

Use and suitability.—All of this soil is under forest. If cleared it would be fairly well suited to pasture. It would be poor for tilled crops because of its stoniness, droughtiness, bedrock outcrops, and erosion hazard. Fertilizers would be needed to establish and maintain good pastures. Weed control would be difficult because of the loose stones and bedrock outcrops. This soil is in management group 15.

Pace silt loam, eroded undulating phase (2 to 5 percent slopes) (Pc).—This is a light-colored, moderately well drained soil of the old colluvial lands. The soil has formed from local alluvial-colluvial materials washed from uplands underlain largely by cherty limestone. The materials have washed chiefly from areas of Clarksville and Fullerton soils.

The soil normally occurs on foot slopes, fans, or benches immediately below the areas from which the soil materials were washed.

Areas of this soil are comparatively small. They are widely distributed among the soils of the cherty limestone uplands.

Profile description:

0 to 8 inches, pale-brown to light yellowish-brown friable silt loam; contains small amount of chert fragments.
8 to 17 inches, pale-yellow or yellow to brownish-yellow moderately friable silty clay loam; moderately well developed medium subangular blocky structure.
17 to 36 inches +, slightly compacted silty clay loam or silty clay mottled or splotched with pale-yellow, yellow, and brownish yellow.

Most of this soil is moderately eroded. The eroded areas differ from the wooded areas in having lost a part of the surface layer, including the thin layer of high organic-matter content. In some eroded areas, part of the subsoil is mixed with the surface soil in the plow layer. This mixing has resulted in greater variation in the thickness, color, and texture of the present surface layer.

The soil is medium to strongly acid throughout, low in organic matter and plant nutrients, and about medium in water-supplying capacity. The surface soil and the upper part of the subsoil are permeable to roots, air, and water, but the slightly compacted substratum retards the movement of air and moisture within that layer. Surface runoff is slow, and internal drainage is medium to moderately slow. As mapped, this separation includes areas that are chert free to moderately cherty. In only a small acreage is there enough chert to interfere materially with tillage or with the productivity of the soil.

Use and suitability.—Practically all of this soil is used for crops. A small part is idle or in pasture.

This soil is fairly well suited to most of the commonly grown crops, and a moderately short rotation can be used. The soil is easy to work and fairly easy to conserve. It is only moderately productive, however, because of its low fertility and moderate water-supplying capacity. Its use suitability is somewhat limited by its restricted internal drainage. Crops such as corn, small grains, common lespedeza, and sericea lespedeza are successfully grown if enough fertilizer is added. Red clover is fairly successful if properly fertilized, but alfalfa stands do not last long, even if adequately fertilized. The soil is well suited to pasture if properly fertilized. It is in management group 6.

Pace cherty silt loam, eroded rolling phase (5 to 12 percent slopes) (Pa).—This is a light-colored moderately well drained soil of the old colluvial lands. The small irregularly sloped areas are widely distributed throughout the uplands that are underlain by cherty

limestone. The soil has formed from local alluvial-colluvial materials that washed from these uplands. The soil differs from Pace silt loam, eroded undulating phase, mainly in occupying stronger slopes and in being more cherty. It is also slightly more eroded. From 25 to 75 percent of the original surface soil has been removed by sheet erosion.

The present surface layer is a pale-brown to yellowish-brown or brownish-yellow moderately cherty friable silt loam. In many places plowing has mixed some subsoil materials with the surface soil. The subsoil is a yellow or brownish-yellow moderately friable cherty silty clay loam. The colluvial deposit is underlain by limestone practically everywhere at depths of 3 feet or more.

This soil is strongly acid, low in organic matter and plant nutrients, and moderately low in water-holding capacity. The surface soil and upper part of the subsoil are permeable to roots, air, and water, but the slightly compacted or weakly cemented substratum retards the movement of air and moisture. Surface runoff is medium, and internal drainage is moderately slow. Nearly everywhere, small and medium angular chert fragments are scattered over the surface and throughout the profile. They do not prevent tillage but make it somewhat difficult.

Use and suitability.—An estimated 55 percent of this soil is used for crops, and 30 percent for hay and pasture; the rest is idle.

The soil is suited to most of the crops grown, but mainly because of low natural fertility and moderately low water-supplying capacity, it is only moderately productive. Corn, small grains, cotton, tobacco, and lespedeza are grown, but if fertilizer is not applied, yields are low. Red clover can be grown successfully if properly fertilized. Alfalfa stands last only a short time, even if well managed. Except for chert, the soil is easy to work, but it is more difficult to conserve than the eroded undulating phase of Pace silt loam. The rotations will need to be longer and include close-growing and sod-forming crops. The soil is well suited to about all pasture plants, but fertilizer is necessary for satisfactory growth. This soil is in management group 10.

Pace cherty silt loam, eroded hilly phase (12 to 25 percent slopes) (Pb).—This light-colored moderately well drained cherty soil occurs at the bases of steeper upland slopes. The parent materials from which it was derived have washed or rolled from areas of Fullerton and Clarksville soils on the ridges or adjacent steep slopes of Rockland, limestone. This soil differs from Pace cherty silt loam, rolling phase, chiefly in occupying steeper slopes. It is also generally better drained and has thinner, less distinct horizons and a colluvial deposit that is not so thick. A considerable part of the original surface layer has been lost through erosion, and chert has accumulated on the surface and in the plow layer.

This inextensive soil occupies small, widely distributed irregular areas. Much of it occurs in the cove of Battle Creek along the bases of slopes occupied by Rockland, limestone. A small acreage included within this mapping unit is not eroded.

The present surface layer ranges from yellowish-brown to light brownish-gray in color and from cherty silt loam to cherty silty clay loam in texture. The subsoil is yellowish-brown or brownish-yellow moderately friable cherty silty clay loam.

Use and suitability.—Most of this soil is used for crops and pasture. Some is idle or has been abandoned.

This soil is poorly suited to crops, chiefly because of its low fertility and susceptibility to erosion. It is moderately hard to work and is difficult or very difficult to conserve if used for row crops. With adequate fertilization, however, fair pastures can be established and maintained. Pasture yields would probably not be high, even under a high level of management, because of the low water-supplying capacity. This soil is in management group 15.

Prader silt loam (0 to 2 percent slopes) (Pd).—This is a gray, poorly drained soil. It consists of young alluvium washed chiefly from soils underlain by shales and sandstone. It occupies bottom lands little higher than the normal level of the streams. Areas of this soil are mainly in long narrow belts. Many areas, especially those on the river bottoms, are in depressional old stream channels. Small areas are along most of the streams, but much of the acreage is along the Sequatchie River. Much of the soil on narrow bottoms of perennial streams receives considerable seepage from the slopes of the upland. Drainage is poor. Water stays on the surface much of the year, and the water table is near the surface at all times. The native vegetation was largely water-tolerant oaks, willow, and sweetgum.

Profile description:

0 to 7 inches, dark yellowish-brown friable silt loam splotched with light olive gray; contains strong-brown stains.

7 inches +, olive-gray or light-gray firm silty clay loam or fine silt loam; contains strong-brown and brownish-yellow stains; this layer extends to the water table.

The thickness of the alluvium varies from 4 to 10 feet or more.

The soil is nearly neutral to slightly acid and has a moderate amount of plant nutrients and organic matter. The soil, when not saturated with water, is fairly permeable to air, roots, and water. The high water table greatly restricts root development of many crops.

Use and suitability.—Practically all of this soil has been cleared, but a large part has grown up in willow and alder thickets. Most of the cleared areas are in pasture, but some are in crops, mainly corn. Average yields of corn are low, and total failures are common.

Artificial drainage might broaden the use suitability, but in the main, the soil would still have limited suitability except for corn, soybeans, sorghum, and similar summer annuals. Moderate fertility and the ability to support vegetation during long dry spells make the soil fair for pasture. This soil is in management group 16.

Robertsville silt loam (0 to 3 percent slopes) (Ra).—This is a poorly drained gray soil on old stream terraces. In most places the old alluvium from which the soil has developed was washed from uplands underlain chiefly by limestone. In places the soil appears to have formed from local wash rather than from

stream alluvium. This soil has developed on nearly level to slightly depressed areas under a forest cover of water-tolerant trees. It does not occur in a definite pattern, but occupies widely scattered small areas throughout the valley. Closely associated are soils of the Taft, Capshaw, Prader, and Melvin series.

Profile description:

0 to 8 inches, light-gray to brownish-gray friable silt loam, mottled with strong brown; contains a few small concretions; in wooded areas the upper 1 or 2 inches may be stained dark gray by organic matter.
8 to 20 inches, light-gray friable silt loam or silty clay loam, highly mottled with strong brown; contains many small brown concretions.
20 to 30 inches, light-gray compact silty clay loam or silty clay; contains many soft yellowish-red concretions.
30 inches +, predominantly yellowish red extremely compact silty clay, mottled with light gray; contains many large, soft, black concretions; limestone bedrock at depths between 3 and 12 feet.

The soil is strongly to very strongly acid and appears to be very low in organic matter and plant nutrients. The highly mottled gray color of the profile indicates that the water table is high much of the time. The surface soil and the upper part of the subsoil are permeable when not saturated with water. The relatively impermeable compact layer greatly retards or almost prohibits passage of water. Although the profile varies somewhat in depth to the compact fragipan, this does not affect its use suitability. The soil is easy to work, and there is no erosion problem. Surface runoff is very slow or ponded, and internal drainage is very slow. The water-supplying capacity is low.

Use and suitability.—Most of this soil is in woodland pasture or in permanent pasture. A few areas are used for crops, principally corn, sorghum, or soybeans. Yields are very low and failures are common.

The soil is too poorly drained for most of the commonly grown crops. It is fairly well suited to a few crops, particularly those that can be planted late in spring, such as sorghum and soybeans. Lespedeza does fairly well on areas that have fair surface drainage. The soil is fairly well suited to pasture, but the pastures generally are of poor quality. Also, the soil occurs in small irregular areas in association with soils that are suitable for crops; therefore it is not practical to use them for pasture in many places. Draining of excess surface water by the use of open ditches or by bedding would broaden the use suitability somewhat and increase the average yield of certain forage crops and pastures. Because of the comparatively impermeable compact layer, tile drainage probably would not be effective. The soil is moderately easy to work when at the proper moisture content, but it is not dry enough for very long periods. The soil is easy to conserve, though it is difficult to maintain a satisfactory drainage system. This soil is in management group 16.

Rockland, limestone (12 to 60+ percent slopes) (Rb).—This land type occupies the lower slopes of the Cumberland escarpment. Ledges and outcrops of clayey limestone occupy 50 percent or more of its surface. Slopes range from 12 to 60 percent, but those ranging between 25 and 60 percent are dominating.

A shallow layer of soil material covers some areas of this land type, but generally such materials occur only in cracks and crevices. The soil materials vary considerably, but generally consist of dark silty clay. Enough of the soil materials are present to support a thin stand of trees. The forest consists of a mixture of deciduous and coniferous trees, including post, red, and blackjack oaks; redbud; redcedar; and other species.

Nearly all of this land type is included in the Rockland, limestone-Bouldery colluvium-Rockland, sandstone soil association. It occurs in large areas and occupies much of the escarpment of that part of the county on the Cumberland Plateau.

Use and suitability.—All of this land type is in cutover forests. The land is practically worthless for crops or for pasture. In many places it has little value even for forest, as rock outcrops on the greater part of the surface. There are numerous cedar glades where some cedar is cut and marketed. This land type is in management group 19.

Rockland, sandstone (12 to 60+ percent slopes) (Rc).—This land type consists of nearly vertical bare sandstone escarpments where the slopes are predominantly more than 60 percent. Only a small acreage has slopes between 12 and 60 percent. This land forms the cliffs, or escarpments, of the Cumberland Plateau. Practically all of it is in the Rockland, limestone-Bouldery colluvium-Rockland, sandstone association. The land is almost devoid of vegetation, but on the lower slopes it has a few scattered trees, chiefly oak, hickory, pine, and dogwood.

Use and suitability.—Because about 80 percent of its surface is exposed rock, this land type has no agricultural value. A little timber is cut from it with great difficulty. This land is in management group 19.

Sequatchie loam, undulating phase (2 to 5 percent slopes) (Sf).—This brown well-drained soil occupies small to large areas. It occurs on low stream terraces or second bottoms of all the major streams of the county and in mountain coves. This soil is closely associated with Staser, Hamblen, and Whitwell soils and with other Sequatchie soils. It is one of the more important agricultural soils of the county. The parent material consists of general alluvium washed largely from uplands underlain by sandstone, but it contains an appreciable amount of limestone materials. The soil was formed under a cover of deciduous forest.

Profile description:

0 to 11 inches, brown to yellowish-brown very friable loam.
11 to 28 inches, yellowish-brown to brownish-yellow or, in places, strong-brown friable loam or light clay loam.
28 inches +, brownish-yellow to yellowish-brown friable clay loam, faintly splotched with gray and yellow in most places.

Limestone underlies the alluvial deposit at depths of 5 to 10 feet or more.

The soil is medium to strongly acid. It appears to be moderately high in organic matter and most plant nutrients. A few cobblestones occur on the surface and throughout the profile, but they do not interfere with tillage. Good tilth is easy to maintain, and the soil can be tilled within a wide range of moisture content. The soil is permeable to roots, air, and moisture. Water is readily absorbed and is well retained; the

water-supplying capacity is fairly high. Both surface runoff and internal drainage are medium.

Use and suitability.—All of this soil has been used for crops and pasture. About 30 percent is now in corn; 15 percent is in small grains; 30 percent is in hay; 10 percent is in pasture; 10 percent is in miscellaneous crops, including vegetables and tobacco; and about 5 percent is idle.

This soil can be used intensively for many row crops if adequately limed and fertilized. Some lime and complete fertilizer should be applied to obtain high yields of most crops. The soil can be maintained under a short rotation that includes a deep-rooted legume to supply the needed nitrogen. It is only slightly susceptible to erosion and is easy to work and to conserve. When crops are rotated and adequately fertilized, no special practices for controlling runoff are necessary. This soil is in management group 3.

Sequatchie loam, eroded undulating phase (2 to 5 percent slopes) (Sg).—This brown, well-drained, alluvial-colluvial soil is one of the most important agricultural soils of the county. It has formed mainly from materials washed or rolled from uplands underlain chiefly by sandstone but it contains an appreciable amount of limestone materials. It occupies positions 5 to 25 feet above the present flood plains, so that little if any of it is ever flooded. The soil differs from Sequatchie loam, undulating phase, in being slightly to moderately eroded. Also it occurs at higher elevations and is partly colluvial in origin. Normally it occupies positions about half way between the Sequatchie soils of the low second bottoms and the Allen soils of the old high colluvial lands, or the Cumberland, Waynesboro, and Etowah soils of the old high terraces.

The soil occurs in small to large areas that are widely distributed throughout the valley. Much of it occurs in mountain coves or on broad smooth areas extending out from the base of the steep mountains. A large acreage is in the cove of Battle Creek. The soil has developed under a forest that is predominantly deciduous.

Profile description:

0 to 10 inches, brown to yellowish-brown or dark yellowish-brown very friable loam.
10 to 17 inches, mingled reddish-yellow and brown very friable light clay loam to loam; medium to coarse weak crumb structure.
17 to 38 inches +, reddish-yellow or strong-brown friable fine sandy clay or light clay loam; moderately well developed medium subangular blocky structure; structural aggregates can be easily crushed into a granular mass; limestone bedrock normally occurs at depths of 10 feet or more.

This soil is slightly to moderately eroded; therefore, the depth and texture of the surface layer vary somewhat from place to place. Texture ranges from loam to light clay loam, and the depth from 5 to 11 inches. Over most of the areas, plowing is done within the surface layer.

The soil is medium to strongly acid and appears to be high in organic matter. It is moderately well supplied with most plant nutrients. It is very permeable to roots, air, and moisture. Water is readily absorbed and fairly well retained. The water-supplying capacity is fairly high. Because of the permeability and mild slopes, surface runoff is slow. Good tilth is easy to maintain, and the soil can be tilled within a wide range of moisture content. The soil is almost free of stones, although it contains a few sandstone cobblestones.

Use and suitability.—Practically all of this soil is used for crops. Little of it is ever idle.

This soil is well suited to many kinds of crops and can be used intensively for row crops if adequately limed and fertilized. The soil is very easy to work and to conserve, and water is not hard to control. The soil responds well when lime, phosphorus, potassium, and nitrogen are added. The response to these amendments ordinarily is not so lasting, however, as on Cumberland and Etowah soils. Alfalfa is grown, but results probably would be better if more fertilizer were applied, particularly potassium. The excellent properties of this soil make it highly suitable for vegetables. This soil is in management group 3.

Sequatchie loam, eroded rolling phase (5 to 12 percent slopes) (Sh).—This is a brown well-drained soil formed on alluvial-colluvial deposits. The materials from which it was derived were washed largely from uplands underlain by sandstone, but they include some materials from limestone. The soil differs from Sequatchie loam, eroded undulating phase, in being slightly more eroded and in having stronger slopes. Erosion has removed an estimated 25 to 50 percent of the original surface soil and, in a few small spots, a part of the subsoil.

This soil lies on low terrace escarpments, in rather narrow areas. The areas are small or medium-sized and are widely distributed throughout the valley. Much of the acreage occurs along the rims of the valley immediately below the Allen soils of the old colluvial lands. Some of the soil is in mountain coves. The soil is closely associated with the Staser, Hamblen, Whitwell, Allen, and Waynesboro soils and with other Sequatchie soils.

The present surface layer consists of a brown friable loam from 4 to 8 inches thick. The subsoil is reddish-yellow to strong-brown or brownish-yellow friable clay loam or sandy clay loam. The content of organic matter and plant nutrients, as well as the water-supplying capacity, is somewhat lower than for the eroded undulating phase.

Use and suitability.—All of this soil is used for crops and pasture. Practically all the common crops are grown, and the soil is well suited to them. An estimated 60 percent is in crops and 30 percent in pasture. About 5 to 10 percent is idle each year.

This soil is not so desirable for agriculture as Sequatchie loam, eroded undulating phase. The stronger slopes make it more susceptible to erosion, and it can be used much less intensively for row crops. Longer rotations that include a close-growing or sod-forming crop will be needed. The soil is easy to work and can be tilled within a wide range of moisture content. It responds well to good management. High crop yields can be maintained by using proper crop rotations and amendments. Good pastures are easy to establish and to maintain.

Alfalfa is grown successfully in some places, but it would probably do better in others if it were fertilized adequately. The soil seems to be better for alfalfa than the Cumberland and Etowah soils. Sequatchie loam, eroded rolling phase, is in management group 8.

Sequatchie fine sandy loam, undulating phase (2 to 5 percent slopes) (Sd).—This well-drained sandy soil occurs on the low terraces or second bottoms of practically all the major streams of the county and in mountain coves. The parent material consists of general alluvium, in most places transported from uplands underlain by sandstone. Some material came from limestone. Most of the soil occupies small to large areas at slightly higher elevations than the present flood plain. Nevertheless, many areas are flooded when the water is high. This soil resembles Sequatchie loam, undulating phase, but has a coarser texture throughout. It is closely associated with Staser, Hamblen, and Whitwell soils and with other Sequatchie soils. It has formed under a deciduous forest.

Profile description:

0 to 10 inches, yellowish-brown to brown very friable fine sandy loam.
10 to 30 inches, brownish-yellow to yellowish-brown very friable light clay loam or sandy clay loam.
30 inches +, brownish-yellow very friable sandy loam, sandy clay loam, or light clay loam, faintly splotched with gray and yellow in most places.

Limestone underlies the alluvial deposit at depths of 8 feet or more.

The soil is generally medium to strongly acid, but some areas are only slightly acid. It is moderately well supplied with most plant nutrients and appears to be moderately high in organic matter. A few cobblestones are on the surface and throughout the soil, but there are not enough to interfere materially with cultivation. Good tilth is easy to maintain. The soil can be tilled within a wide range of moisture content. The moisture-holding capacity is rather poor, but the position of this soil is such that the supply of moisture is ordinarily adequate for growing plants. Surface runoff is slow, and internal drainage is medium.

Use and suitability.—Practically all of this soil is used for pasture or crops, but about 5 to 10 percent is idle. The principal crops are corn, hay, crimson clover, and small grains, but many others are grown.

This soil is well suited to many different crops and is well suited to pasture. It can be used intensively for row crops if adequately limed and fertilized. It is somewhat deficient in lime, phosphorus, potassium, and nitrogen for high yields of most crops, but the soil responds well to amendments. The soil can be maintained under a short rotation that includes a deep-rooted legume to supply the needed nitrogen. It is only slightly susceptible to erosion. When crops are rotated and adequately fertilized, water control is not difficult. This soil is in management group 3.

Sequatchie fine sandy loam, eroded undulating phase (2 to 5 percent slopes) (Se).—This is a brown, well-drained, sandy soil on smooth alluvial-colluvial areas or low stream terraces. Its parent materials have washed or rolled chiefly from uplands underlain by sandstone, but an appreciable amount of limestone materials is included. This soil differs from Sequatchie fine sandy loam, undulating phase, mainly in being slightly to moderately eroded. It also occurs at slightly higher elevations. Little if any is ever flooded.

This soil is not extensive, and most of the acreage is on the rims of mountain coves. It is closely associated with Staser, Hamblen, and Whitwell soils; with Cobbly alluvium, Staser and Sequatchie soil materials; and with other Sequatchie soils.

The present surface layer is yellowish-brown to brown very friable fine sandy loam about 5 to 10 inches thick. The subsoil is a brownish-yellow to strong-brown friable fine sandy clay to sandy clay loam. Limestone underlies it practically everywhere at depths of 5 to 10 feet or more.

Use and suitability.—All of this soil has been used for crops and pasture. About 5 to 10 percent is now idle. The principal crops are corn, cotton, crimson clover, hay, and small grains.

The soil is well suited to many kinds of crops, including nearly all of those common to the county. Nevertheless, adequate lime and fertilizer must be applied for good yields. The soil is especially desirable for early maturing truck crops. Because of its coarser texture and the consequent lowered water-supplying capacity, it is not so well suited to crops as Sequatchie loam, eroded undulating phase. The positions that it occupies, however, are such that the water supply is ordinarily adequate for most crops. The coarser texture decreases the ability of the soil to hold or store plant nutrients. The soil is somewhat lacking in lime, phosphorus, potassium, and nitrogen for high yields of most crops. It responds well to applications of these amendments. The soil is only slightly susceptible to erosion; therefore, it can be used in a short rotation if the crops are properly selected and fertilized. This soil is in management group 3.

Sequatchie cobbly fine sandy loam, undulating phase (2 to 5 percent slopes) (Sa).—This is a brown, well-drained, cobbly soil of the low stream terraces. The parent materials consist of general alluvium washed largely from uplands underlain by sandstone, but they include some limestone materials. Most of the areas are slightly above the present overflow level, but some are flooded when water is high. The soil has formed on almost level areas under a predominantly deciduous forest.

The soil occurs on small or medium areas along practically all the major streams, but much of the acreage is along the streams that flow out of mountain coves. The soil is associated with Staser and Hamblen soils; with Cobbly alluvium, Staser and Sequatchie soil materials; and with other Sequatchie soils.

Profile description;

0 to 10 inches, yellowish-brown to brown very friable cobbly fine sandy loam.
10 to 30 inches, brownish-yellow to yellowish-brown or strong-brown very friable cobbly light clay loam or cobbly sandy clay loam.
30 inches +, brownish-yellow very friable cobbly sandy loam, cobbly sandy clay loam, or cobbly light clay loam faintly splotched with yellow and gray in most places.

Limestone underlies the alluvial deposit at depths of 5 to 10 feet or more.

The soil is medium to strongly acid and appears to be moderately well supplied with organic matter and most plant nutrients. It is very permeable to roots,

air, and moisture. Sandstone fragments up to 3 inches in diameter, on the surface and throughout the profile, make tillage difficult. The high content of stones and the coarse texture lower the ability of the soil to hold water and plant nutrients. It may be practical to remove the stones in some places. Rainfall is readily absorbed, but percolation is moderately rapid.

Use and suitability.—Most of this soil has been cultivated. About 20 percent is now used for corn; 10 percent for small grains, chiefly oats; 20 percent for hay; and 35 percent for pasture that is largely unimproved. The rest is either idle or is used for other crops.

Except for alfalfa, this soil is fairly well suited to practically all the commonly grown crops. Nevertheless, on many farms it would best be used for permanent pasture because of the difficulty of cultivating and harvesting crops. If the stones were picked up, it would be easier to grow crops. There are not enough plant nutrients to produce high yields of most crops, but the soil will respond well if lime and complete fertilizer are added. This soil is in management group 3.

Sequatchie cobbly fine sandy loam, eroded undulating phase (2 to 5 percent slopes) (Sb).—This is a brown or light-brown, well-drained soil on alluvial-colluvial accumulations or low stream terraces. The parent materials have washed mainly from uplands underlain by sandstone, but some materials from limestone are included. The soil differs from Sequatchie cobbly fine sandy loam, undulating phase, chiefly in having lost a part of the original surface soil through erosion.

This soil occupies small or medium-sized areas, largely on the rims of small mountain coves. It is associated with Allen, Staser, and Hamblen soils; with Cobbly alluvium, Staser and Sequatchie soil materials; and with other Sequatchie soils.

The present surface soil is a brown to yellowish-brown very friable cobbly fine sandy loam, 4 to 8 inches thick. The subsoil is a brownish-yellow to yellowish-brown friable cobbly loam to cobbly light clay loam.

The soil is medium to strongly acid and appears to be moderately well supplied with organic matter and plant nutrients. It is very permeable to roots, air, and moisture. The moisture-holding properties are rather poor, but the position of the soil is such that the water supply is ordinarily adequate for most crops. Surface runoff is slow, and internal drainage is rapid. Sandstone fragments up to 3 inches in diameter are on the surface and throughout the soil. They make tillage difficult and reduce the ability of the soil to hold water.

Use and suitability.—All of this soil has been cultivated. About 20 percent is now used for corn; 10 percent for hay; and 35 percent for pasture that is largely unimproved. The rest is idle or used for other crops.

The soil is fairly well suited to almost all the commonly grown crops except alfalfa. Early maturing crops will do better than ones that are late maturing. Nevertheless, on many farms permanent pasture may be the best use for this soil, because of the difficulty of cultivating and harvesting crops. The soil does not have enough plant nutrients to produce high yields of most crops, but it will respond to the addition of lime and complete fertilizer. If it is feasible to remove the stones, the use suitability of the soil will be widened considerably, and yields will be increased. The soil is in management group 3.

Sequatchie cobbly fine sandy loam, eroded rolling phase (5 to 12 percent slopes) (Sc).—This is a brown well-drained soil on recent alluvial accumulations or low stream terraces. The parent materials have washed from uplands underlain mainly by sandstone, but they include some materials from limestone. This soil differs from Sequatchie cobbly fine sandy loam, undulating phase, mainly in occupying stronger slopes and in being moderately eroded. Erosion has removed a part of the original soil, and the present surface soil is yellowish-brown very friable cobbly fine sandy loam to loam about 4 to 8 inches thick. The subsoil is a brownish-yellow to strong-brown friable or very friable cobbly sandy clay loam. Limestone occurs at depths of 5 to 10 feet or more.

Use and suitability.—All of this soil has been cultivated. About 20 percent is now used for corn; 10 percent for small grains, chiefly oats; 20 percent for hay; and 30 percent for pasture that is largely unimproved. The rest is idle or is used for other crops.

This soil is greatly handicapped for cultivation by its high content of stones. The stones either prevent, or greatly hinder, tillage and also lower the ability of the soil to hold water and plant nutrients. The soil is very difficult to work. Because of its strong slopes and the porous texture of the subsoil, it is difficult to conserve. Except for alfalfa, the soil is fairly well suited to nearly all the commonly grown crops. On many farms this soil may best be used for permanent pasture because of the difficulty of cultivating and harvesting crops. In some areas it may be feasible to pick up the stones so that the use suitability of the soil will be increased. The soil is deficient in plant nutrients for high yields of most crops, but it responds well to lime and complete fertilizer. This soil is in management group 8.

Staser loam (0 to 2 percent slopes) (Sm).—This is a brown well-drained friable soil of the first bottoms. The materials from which it has formed washed from uplands underlain by sandstone, shale, and limestone. This soil occurs on nearly level flood plains. It is along practically all the larger streams except the Tennessee River. The areas are long and narrow and normally lie next to the stream. The soil is closely associated with Hamblen and Prader soils on the flood plains and with Sequatchie and Whitwell soils on the adjoining low terraces.

Profile description:

0 to 12 inches, brown, grayish-brown, or yellowish-brown very friable loam; in some places 8 to 15 inches thick.
12 to 36 inches, brown to yellowish-brown friable loam to very fine sandy loam; in some places 20 to 40 inches thick.
36 inches +, brown or yellowish-brown to light yellowish-brown friable loam to very fine sandy loam or light clay loam, lightly splotched with gray and yellow; stratified with thin beds of fine sandy loam, loamy sand, or gravel; 5 feet or more thick.

The surface layer is slightly to medium acid, and the subsoil is medium to strongly acid. The soil is moderately high in organic matter and plant nutrients and has a high water-supplying capacity. All of the profile is readily permeable to roots, air, and water. Surface runoff is very slow, and internal drainage is medium.

A few areas, in which the texture is silt loam, are included in this mapping unit.

Use and suitability.—Nearly all Staser loam is used for crops or pasture. It is used chiefly, and in many places continuously, for corn. Narrow fringes of trees —chiefly hickory, elm, beech, sweetgum, maple, sycamore, and oak—border the streambanks or cover the narrow strips of the low first bottoms next to the stream channel.

Flooding limits the use of the soil. The crops grown are largely summer annuals such as corn, lespedeza, and soybeans. Some risk is involved in growing winter crops, although small grains are grown successfully in many places. Different areas of this soil vary greatly in the length of time they remain under water. Consequently, they vary in their suitability for winter or perennial crops.

The soil is easy to work and very easy to conserve. It can be tilled within a wide range of moisture content. Although floodwaters scour the soil or deposit sandy or gravelly materials on it, flooding ordinarily is beneficial because it adds sediments high in plant nutrients and organic matter. This soil is in management group 1.

Staser fine sandy loam (0 to 2 percent slopes) (Sl).—This is a well-drained, sandy soil of the stream bottoms. The parent material consists of mixed general alluvium washed chiefly from uplands underlain by sandstone and shale, but includes some materials from limestone. The soil occurs on nearly level flood plains of practically all the major streams of the county except the Tennessee River. A large part of the acreage is along the Sequatchie River. The soil is associated with Hamblen and Prader soils on the flood plains and with Sequatchie and Whitwell soils on the adjacent low terraces.

Profile description:

0 to 12 inches, brown or yellowish-brown very friable fine sandy loam.
12 to 38 inches, grayish-brown or light yellowish-brown friable fine sandy loam or very fine sandy loam.
38 inches +, grayish-brown to light yellowish-brown fine sandy loam or loam splotched with gray and yellow.

The soil is slightly acid in most places. It apparently has a moderately high content of organic matter and most plant nutrients. It is permeable to roots, air, and water. Water is readily absorbed but only fairly well retained. Surface runoff is slow, but internal drainage is medium to rapid. Most of the soil is flooded at times.

Use and suitability.—All of this soil has been cultivated. It is used chiefly, and in many places continuously, for corn. Some hay is grown, and a small acreage is in small grains and truck crops.

The soil is well suited to intensive cropping. The susceptibility to flooding restricts its use suitability. Nevertheless, flooding helps to maintain fertility by depositing materials high in organic matter and plant nutrients. The soil is well suited to corn and many hay crops. It is not so well suited to small grains, which tend to lodge, to mature late, and to be susceptible to disease. Although the productivity is relatively high, phosphorus would help to increase yields, and a short rotation should be used. This soil is in management group 1.

Staser cobbly fine sandy loam (2 to 5 percent slopes) (Sk).—This is a brown, well-drained, cobbly soil of the first bottoms. The parent materials consist of mixed general alluvium washed chiefly from uplands underlain by sandstone and shale, but they include some limestone material. This soil differs from Staser fine sandy loam mainly in having cobblestones or stones on the surface and throughout the profile.

The soil is not extensive. It occurs mostly in mountain coves, but small irregularly shaped areas also occur along the streams that issue from the coves.

This soil is young; therefore, well-defined soil horizons have not had time to develop. The 10 to 12 inches at the top of the profile is a brown to grayish-brown very friable cobbly fine sandy loam. Underlying this is yellowish-brown or brown very friable cobbly fine sandy loam or sandy loam that, in some places, is stratified with thin beds of loam, loamy sand, or gravel.

Use and suitability.—Practically all of this soil has been used for pasture or crops, mainly corn and lespedeza. Much of it is idle each year.

The soil is suited to many commonly grown crops, but on most farms it can best be used for permanent pasture. Periodic flooding limits the use of some areas. Stones and cobblestones make tilling and harvesting difficult. They also decrease the water-supplying capacity of the soil and its ability to hold plant nutrients. In some places, where there are not too many stones and cobblestones, it may be worthwhile to pick them up in order to increase the uses of the soil. This soil is in management group 1.

Stony hilly and rolling land, limestone (5 to 25 percent slopes) (Sn).—This mapping unit is locally known as "rockland," "limestone rockland," or "glady land." These terms are applied because of the numerous outcroppings and ledges of limestone rock. The outcroppings occupy from about 10 to 50 percent or more of the surface. Areas of this land are widely distributed throughout that part of the county underlain by limestone. They are closely associated with Talbott and Colbert soils and with the stony land types.

The depth of the soil material between the ledges and outcroppings varies considerably; the deepest part is generally farthest from the rock outcrops. The soil varies in texture from silt loam to silty clay loam, and in depth it ranges from a few inches to several feet. The color ranges from yellow to reddish brown. Most of the soil material between the rocks resembles that of the Talbott soils.

Some areas included with this mapping unit are very stony.

Use and suitability.—An estimated 65 percent of this land has been cleared. It is used largely for pasture.

The very stony areas are suitable only for forest. Elsewhere stoniness definitely precludes use of this

land for cultivated crops, but the areas are suitable for pasture. The land produces some of the earliest spring pasture in the county. Bluegrass does well early in spring and late in fall when the moisture supply is favorable. Lime is necessary for good growth of pasture plants in many places, and phosphorus would improve the growth nearly everywhere. Weed control is very difficult because the stones make clipping difficult. This mapping unit is in management group 17.

Swaim silty clay, severely eroded rolling phase (5 to 12 percent slopes) (So).—This is a yellowish-brown, moderately well drained, heavy-textured soil of the colluvial lands. It occupies fanlike areas at the foot of the Cumberland escarpment. The old colluvium from which the soil has formed washed chiefly from uplands underlain by clayey limestone and occupied by Colbert soils and associated stony land types. Areas of the soil are fairly small and widely separated. They occur at the bases of the slopes from which the parent materials were washed. The soil is closely associated with Allen, Hollywood, and Hermitage soils. It formed under a deciduous forest that included some cedar.

Profile description:

0 to 5 inches, brown to yellowish-brown friable to firm silty clay loam or silty clay.
5 to 16 inches, reddish-brown to yellowish-red very firm or extremely firm silty clay or clay; well-developed coarse blocky structure.
16 to 38 inches +, reddish-brown to yellowish-red extremely firm clay or silty clay splotched with brownish yellow and specked or stained with black; well-developed very coarse blocky structure.

Because this soil receives runoff from mountain slopes, erosion control is difficult. In a few small areas, only moderate erosion has occurred. Most areas are so eroded, however, that tillage has mixed the remnants of the original surface layer with the upper part of the subsoil. In many small areas, tillage is entirely within the subsoil. Shallow gullies occur in most areas, and deep gullies are common.

The soil is medium acid and appears to contain a moderate amount of organic matter and plant nutrients. Surface runoff is rapid, and internal drainage is moderately slow. The soil is moderately permeable to roots, but circulation of air and water is moderately slow. The water-supplying capacity is somewhat low.

In most places this soil, as is typical of the Swaim soils, merges gradually into areas of the stony land types, and the line between the two mapping units is not always distinct. Many rock outcrops, which are indicated by rock outcrop symbols, occur on the upper slopes of the soil. On long gentle slopes, this soil in many places merges into areas of Hermitage soils. As a result, the soil in some included areas is reddish brown.

Use and suitability.—Most of this soil has been used for pasture or crops. Corn, wheat, soybeans, lespedeza, crimson clover, and red clover are now the main crops. An estimated 40 percent is abandoned or in brushy pasture.

Susceptibility to erosion and low water-supplying capacity limit the usefulness of the soil for crops. The soil is difficult to conserve, and generally requires a long rotation and artificial drainage to control runoff. Under a high level of management, many different crops can be grown successfully. Because of droughtiness, however, yields will vary considerably. Average yields will be less than those of crops on the associated Hermitage soils. It is necessary to use fertilizer for some crops, such as alfalfa and red clover. The soil can be worked only within a narrow range of moisture content. It puddles if plowed too wet and clods if too dry. Many areas are best suited to permanent pasture or to a semipermanent hay crop. This soil is in management group 11.

Swaim silty clay loam, eroded undulating phase (2 to 5 percent slopes) (Sp).—This is a yellowish-brown, moderately well drained, heavy-textured soil of the colluvial lands. The old colluvium from which the soil has formed has washed chiefly from uplands underlain by clayey limestone and occupied by Colbert soils and by the associated rock land or stony land types. This inextensive soil occurs on milder slopes and is less eroded than Swaim silty clay, severely eroded rolling phase. Surface runoff is not so rapid. Consequently, the soil is not so susceptible to erosion. A few areas, under forest, are only slightly eroded, but on most of this soil, erosion is moderate. In some areas most of the original surface layer remains, although generally the plow layer consists of remnants of the original surface layer mixed with the upper part of the subsoil. The subsoil is exposed in some places. Shallow gullies are common.

The present surface layer is brown to yellowish-brown friable to firm silty clay loam. The subsoil is a yellowish-red or, in places, a brownish-yellow very firm silty clay, splotched with gray, yellow, and brown. It contains some soft black concretions. In places the subsoil is reddish brown, highly plastic, and slowly pervious to water.

This soil is generally medium acid and has a moderate amount of organic matter and plant nutrients. It is permeable to plant roots, but permeability to air and water is moderately slow. Surface runoff is medium, and internal drainage is slow. The water-supplying capacity is moderately low. The soil is easily worked within limited range of moisture content. Some limestone bedrock outcrops occur, but they do not interfere greatly with tillage.

Use and suitability.—Most of this soil is used for pasture or crops. A small acreage is still under forest, and these areas are generally grazed. Corn, wheat, soybeans, lespedeza, red clover, and crimson clover are the principal crops.

This soil is fairly well suited to pasture and crops. It is susceptible to erosion, but it is easier to conserve and shorter rotations can be used than on Swaim silty clay loam, severely eroded rolling phase. Amendments are needed to establish good pastures and to grow deep-rooted legumes successfully. Low water-supplying capacity limits the response to good management. This soil is in management group 7.

Taft silt loam (0 to 3 percent slopes) (Ta).—This imperfectly drained soil occurs on stream terraces. It was derived from old mixed alluvium washed from uplands underlain by limestone and by other rocks. In

degree of drainage, color, and development of the pan layer, this soil is halfway between the better drained Capshaw and Wolftever soils and the poorly drained Robertsville soil with which it is closely associated.

Taft silt loam occurs on nearly level stream terraces. Part is on terraces along the Tennessee River, where it is associated with Wolftever, Melvin, Huntington, and Lindside soils. Some of the soil occupies almost level areas or depressions on higher terraces in association with Robertsville, Capshaw, and Etowah soils. The areas are small and irregularly shaped.

Profile description:

0 to 6 inches, brownish-gray or light-brown friable silt loam; 5 to 8 inches thick.
6 to 22 inches, brownish-yellow to pale-yellow moderately firm heavy silt loam or silty clay loam faintly splotched with light gray and strong brown in the upper part; many prominent splotches in the lower part of this horizon; 12 to 20 inches thick.
22 to 42 inches, mottled gray, yellow, and brown firm silty clay loam; contains numerous small, dark concretions; 15 to 25 inches thick.
42 inches +, mottled gray, yellow, and brown firm silty clay loam; contains considerable chert in places.

The soil is strongly to very strongly acid and low in organic matter and plant nutrients. Surface runoff is very slow, and internal drainage is slow. The surface soil and subsoil are permeable, but the layer that contains the concretions is relatively impermeable. The water table is at or near the surface in rainy seasons, especially during winter and early in spring. For this reason the soil is very poorly aerated at times, and root development is restricted. The water-supplying capacity is moderately low. The soil is free of stones or gravel in most places, but on the low terraces of the creeks it contains considerable quantities of water-worn chert.

Use and suitability.—Practically all areas of this soil have been used for crops and pasture. At present the chief crops are corn, soybeans, and lespedeza. Also grown are white, alsike, and Ladino clovers and redtop. Crop yields are low, and pastures are largely unimproved and low yielding. Much of the acreage is idle each year.

The soil is suited to short crop rotations, but because of the limited number of crops that can be grown, long rotations may be better. The improvement of surface drainage by the use of open ditches, bedding, or row direction would somewhat broaden the use suitability and increase yields. Tile drainage ordinarily is not practicable. The soil is easy to conserve, though satisfactory drainage is difficult to maintain. It is easy to work when moisture conditions are right, but that is only for short periods. This soil is in management group 16.

Talbott and Colbert silty clay loams, eroded undulating phases (2 to 5 percent slopes) (Td).—This mapping unit consists of shallow, tough, and plastic soils of the uplands. The soils were derived from clayey limestone residuum. Because of the small acreage, it was not feasible to map these two soils separately. Most areas have lost 25 to 75 percent of the original surface layer, but a few areas are not eroded. The soils have formed under a deciduous forest that included some cedar.

These soils occupy small areas that are widely scattered throughout the valley. Little of the acreage occurs on any one farm.

Profile description (Colbert silty clay loam, eroded undulating phase):

0 to 7 inches, grayish-brown firm to friable silty clay loam; massive.
7 to 16 inches, brownish-yellow extremely firm clay; contains many very dark gray or black stains; very coarse blocky or massive structure.
16 inches +, light olive-brown to olive-brown and brownish-yellow extremely firm dense clay, splotched, streaked, stained, or spotted with very dark gray or black; massive structure; bedrock at a depth of about 27 inches.

Profile description (Talbott silty clay loam, eroded undulating phase):

0 to 7 inches, brown moderately friable silt loam to silty clay loam; medium crumb structure.
7 to 24 inches, yellowish-red to red very firm silty clay or clay; strongly developed coarse blocky structure.
24 inches +, yellowish-red extremely firm silty clay or clay, splotched with gray, reddish brown, and brownish yellow; bedrock at depths of 3 to 5 feet.

These soils are extremely variable in thickness of layers and in depth to bedrock. Flat limestone fragments and limestone rock outcrops are common on the lower slopes and on the narrow ridgetops.

The soils are medium to strongly acid. They are low in organic matter and moderate in content of plant nutrients. Most of the organic matter is in the 2 to 4 inches near the surface. Runoff is moderately rapid, but internal drainage is slow or very slow. The heavy subsoil is not very permeable to roots, air, and water. The water-supplying capacity is low.

Use and suitability.—Most of this mapping unit has been used for crops and pasture. The cleared areas are now generally in pasture or idle. Crop yields are low, and pastures have a low carrying capacity.

This mapping unit is moderately well suited to crops and pasture. Because it is in small areas associated with terrace soils, it is difficult to use and manage properly on many farms. It is not well suited to row crops such as corn, tobacco, and cotton. It is better suited to pasture and hay. Alfalfa and red clover should grow well on areas of the Talbott soil.

Tilth is poor. Both soils are difficult to work and difficult to conserve. They are subject to puddling and clodding. They can be worked only within a very narrow range of moisture content. Effective control of erosion is difficult if the soils are used for row crops. These soils are in management group 7.

Talbott silty clay loam, eroded rolling phase (5 to 12 percent slopes) (Tc).—This is a well-drained plastic soil of the uplands. It has developed from the weathered products of clayey limestone, under forest that was largely deciduous.

This soil occurs on small irregular shaped areas that are widely scattered throughout the valley. Associated are Etowah, Capshaw, and Colbert soils and the stony land types.

Profile description:

0 to 6 inches, brown moderately friable silty clay loam; medium crumb structure.
6 to 24 inches, yellowish-red to red extremely firm silty clay

or clay; strongly developed coarse blocky structure; very hard when dry; strongly plastic when wet.
24 inches +, yellowish-red extremely firm dense clay or silty clay, slightly splotched with brownish yellow; strongly developed very coarse blocky structure.

Much of the original surface layer of this soil has been lost through erosion. As a result of erosion and the consequent mixing with the subsoil, the present surface soil varies greatly in thickness, color, and texture. In places bedrock outcrops.

The soil is medium to strongly acid, about medium in content of plant nutrients, and low in organic matter. Permeability is restricted by the heavy dense subsoil. Chiefly because of the slow permeability, surface runoff is rapid and internal drainage is slow.

A small acreage that is only moderately eroded is included in this mapping unit. Also included are a few small areas in which the color of the profile is slightly darker. These darker colored areas contain slightly more chert than the typical profile. In about 45 acres, slopes range from 12 to 20 percent.

Use and suitability.—Talbott silty clay loam, eroded rolling phase, is nearly all used for crops or pasture. About 70 percent is in unimproved pasture, which has a rather low carrying capacity. Many small cedars grow on the pastures.

This soil is not well suited to tilled crops, although in some places they are grown successfully. It is well suited to permanent pasture, which can be established and maintained rather easily. The soil is difficult to work and to conserve. Tilth is poor, and the soil can be worked only within a narrow range of moisture content. This soil is well suited to deep-rooted legumes, such as alfalfa and red clover, but some fertilizer and lime will be necessary to establish and maintain these crops. On most farms pasture is probably the best use for this soil. The soil is in management group 11.

Talbott silty clay, severely eroded rolling phase (5 to 12 percent slopes) (Tb).—This well-drained plastic soil of the uplands has developed from the weathered products of clayey limestone. It resembles Talbott silty clay loam, eroded rolling phase, but is more severely eroded. Most of the original surface soil has been lost, and the present surface layer consists largely of the yellowish-red or red subsoil material. Shallow gullies are fairly common on some areas. Some areas between gullies still retain a small part of the original surface layer.

The soil occupies small widely separated areas in association with Etowah, Cumberland, and Capshaw soils. It occurs throughout that part of the county underlain by clayey limestone. It appears that this soil was once overlain by terrace deposits that were later removed by erosion.

Use and suitability.—All of this soil has been used for crops and pasture, but now much of it is idle. Some is in unimproved pasture, and a small acreage is in crops. Yields are low, and failures are common.

This soil is severely eroded and is not suited to tilled crops. It is better suited to pasture or semipermanent hay crops. The soil is difficult to work and conserve. It is highly susceptible to further erosion and has a low or very low water-supplying capacity. Good alfalfa stands have been obtained where lime, phosphorus, and manure have been applied, but because of the poor tilth, a satisfactory stand is often difficult to obtain. Erosion has decreased the productivity. Productivity would be increased to some extent by growing grasses and deep-rooted legumes for a number of years. Then the soil might be used in a long rotation. This soil is in management group 11.

Waynesboro loam, eroded undulating phase (2 to 5 percent slopes) (Wg).—This well-drained friable soil occurs on old high stream terraces. It consists of old alluvium washed mainly from sandstone and shale, but partly from limestone and other rocks. It is somewhat coarser textured, more friable, and generally lighter colored than the Cumberland soils. The native vegetation was a hardwood forest of oak, hickory, maple, and yellow-poplar.

The areas are small and narrow and are widely scattered throughout the valley.

Profile description:

0 to 10 inches, brown to light-brown very friable loam; in wooded areas the uppermost 2 inches is stained dark with organic matter.
10 to 18 inches, mixed pale-brown and yellowish-red, with pale brown predominating, friable loam to light clay loam; reddish yellow to strong brown when crushed.
18 to 30 inches, yellowish-red firm fine sandy clay to clay loam.
30 inches +, yellowish-red to red firm silty clay loam or fine sandy clay; many yellow and olive-yellow splotches.

Limestone bedrock or material weathered from limestone underlies the alluvial deposit at depths generally ranging from 5 to 10 feet.

This soil is medium to strongly acid. It appears to have a moderate supply of mineral plant nutrients and organic matter. The soil is permeable to air, roots, and water. It has a high water-holding capacity. Pebbles and a few cobblestones are scattered over the surface and occur throughout the profile in many places, but they do not interfere materially with tillage. Both external and internal drainage are good.

Use and suitability.—Most of the areas are used for crops and pasture. Corn, small grains, lespedeza, alfalfa, red clover, tobacco, and vegetables are the most commonly grown crops.

This soil is very easy to work and easy to conserve. It is well suited to all the crops commonly grown in the county, including alfalfa and red clover. It is suited to moderately intensive use and probably could be maintained in a rotation that includes row crops one-half the time. Preferably, row crops should not be grown oftener than every other year and never more than 2 years in succession. Lime and phosphorus are necessary to get a good growth of alfalfa, red clover, and other deep-rooted legumes. Favorable response is obtained from using phosphorus and nitrogen on practically all crops, but there is no need to add nitrogen to legumes nor to crops that immediately follow them. This soil is in management group 4.

Waynesboro loam, eroded rolling phase (5 to 12 percent slopes) (Wh).—This is a well-drained friable soil on high stream terraces. The parent material has washed mainly from uplands underlain by sandstone and shale, but it includes some materials from limestone. The soil differs from Waynesboro loam, eroded undulating phase, chiefly in having stronger slopes.

Much of the original surface soil has been lost, and in many places the present surface layer contains some of the uppermost part of the subsoil. In most areas, however, tillage is still within the original surface soil.

The soil occupies relatively small areas on the rolling tops of the terraces and is widely distributed throughout the valley. Its surface soil is a light-brown very friable loam to light clay loam. The subsoil is a yellowish-red friable fine sandy clay to clay loam. Limestone occurs nearly everywhere at depths of 5 feet or more.

About 40 acres, which is still under forest, differs from the typical soil in not being eroded.

Use and suitability.—Practically all of this soil is cultivated. Probably less than 15 percent is in permanent pasture, and most of the rest is used to grow corn, cotton, small grains, hay, and other crops. Although many different crops are grown, generally a systematic rotation is not practiced.

The soil is well suited to all the crops commonly grown in the area, including alfalfa. Because of stronger slopes, management requirements are more exacting than those for Waynesboro loam, eroded undulating phase. Longer crop rotations should be used, and a row crop should not be grown oftener than once every 3 or 4 years. Fertilizer and lime requirements are similar to those of the eroded undulating phase. The soil is susceptible to erosion when not under a plant cover. This soil is in management group 9.

Waynesboro clay loam, severely eroded rolling phase (5 to 12 percent slopes) (Wa).—This well-drained soil occupies old high stream terraces. The old alluvium from which the soil has formed washed from uplands underlain chiefly by sandstone, but it contains some materials from limestone. It occurs on small, widely scattered areas throughout the valley, in association with Cumberland and Sequatchie soils and with other Waynesboro soils. This soil differs from Waynesboro loam, eroded undulating phase, principally in having stronger slopes and in being severely eroded. The degree of erosion varies greatly within short distances. In most places the plow layer is entirely within the original subsoil layer. In others the plow layer is a mixture of remnants of the original surface layer and the upper part of the subsoil. Shallow gullies are common, and there are some deep gullies.

The present surface layer is brown to strong-brown or yellowish-red loam or clay loam. The subsoil is red to yellowish-red friable clay loam or fine sandy clay.

Use and suitability.—All of this soil has been used for pasture and crops. A high proportion is now idle or abandoned. Some is used for crops, chiefly corn, cotton, and lespedeza, but yields are very low.

The soil has been severely injured by erosion, and in its present condition it is only fair for crops and pastures. It is moderately easy to work, but is difficult to conserve, mainly because of its susceptibility to further erosion. Although a number of crops can be grown, yields are generally low. Good tilth is difficult to maintain, and gullies interfere with the use of heavy farm machinery. Under a high level of management, however, fair to good pastures can be established and maintained. After the soil has been under a good program of pasture management for a time, fertility should be improved and physical properties restored to the point that the soil will again be productive of crops. This soil is in management group 12.

Waynesboro loam, hilly phase (12 to 25 percent slopes) (Wk).—This well-drained friable soil occurs on old high stream terraces. It has developed in old alluvial materials that washed from uplands underlain mainly by sandstone, but that included some materials from limestone. The areas are small and widely separated. They occur throughout the valley, but most are nearer the western side. The soil normally occupies comparatively short hill slopes. It is closely associated with Cumberland and Sequatchie soils of the adjacent terrace lands and with Staser and Hamblen soils, and is more friable throughout. It is generally lighter colored and somewhat less productive.

This soil has developed under a forest that is predominantly deciduous.

Profile description:

0 to 8 inches, pale-brown to brown very friable loam; topmost 1 to 2 inches stained dark with organic matter.
8 to 16 inches, predominantly pale brown, mixed with yellowish-red, friable loam to light clay loam; reddish yellow to strong brown when crushed; fine blocky structure.
16 to 25 inches, yellowish-red friable to firm fine sandy clay to clay loam; moderately developed fine to medium blocky structure.
25 to 50 inches +, yellowish-red to red friable to firm fine sandy clay; well-developed medium blocky structure.

The depth of the alluvial deposit generally ranges from 4 to 10 feet.

The soil is medium to strongly acid and appears to have a moderate supply of mineral plant nutrients and organic matter. It is permeable to air, roots, and moisture. Rainfall is readily absorbed and well retained. The water-supplying capacity is moderate to high. Because of strong slopes, surface runoff is fairly rapid. Occasional small sandstone cobblestones or stones occur on the surface and in the profile, but they are not numerous enough to lower the productivity of the soil.

Use and suitability.—All of this soil is under forest. The forest has been cut over many times, and the stand is rather thin and of low quality.

This soil is moderately fertile and has a medium to high water-supplying capacity. The strong slopes and susceptibility to erosion make it difficult to cultivate and conserve. Except under a very high level of management, it is not well suited to tilled crops. The soil is fairly productive of close-growing crops and pasture if adequately fertilized. Practically all of the common hay and pasture plants are well adapted to it. This soil is in management group 13.

Waynesboro loam, eroded hilly phase (12 to 25 percent slopes) (Wl).—This friable, well-drained soil occurs on old stream terraces. The areas are medium in size. They are scattered throughout the valley, in association with Cumberland, Etowah, and Sequatchie soil, and with other Waynesboro soils. The old alluvium from which the soil was derived washed from uplands underlain mainly by sandstone and shale, but it includes some materials from limestone.

A part of the original surface soil has been removed

by erosion. The surface layer now is a brown or light-brown to strong-brown friable loam or light clay loam. The subsoil is red to yellowish-red, firm but friable clay loam or fine sandy clay. The depth of the alluvial material varies; it is everywhere more than 2 feet and is more than 10 feet in many places.

Use and suitability.—All of this soil is used for crops and pasture. Except that more of the soil is idle or in unimproved pasture, it is used and managed much like Waynesboro loam, eroded rolling phase. Strong slopes and susceptibility to erosion make it rather difficult to cultivate and conserve. It is moderately fertile, however, and has a moderate water-supplying capacity. The soil is not well suited to tilled crops but is suited to pasture. Pasture and close-growing crops need adequate fertilization if pasture is to produce fair-quality forage or if yields of close-growing crops are to be fairly good. The soil is in management group 13.

Waynesboro clay loam, severely eroded hilly phase (12 to 25 percent slopes) (Wb).—This soil of old stream terraces is friable and well drained. It differs from Waynesboro loam, hilly phase, chiefly in being severely eroded. Most of the original surface soil, and in places a part of the subsoil, has been lost through erosion.

The present plow layer consists of light-brown to yellowish-red friable clay loam. The subsoil is red to yellowish-red, moderately friable clay loam or fine sandy clay.

Shallow gullies are common, and a few cannot be crossed with heavy machinery. Some of the intergully areas still have a part of the original surface soil, which has been mixed with the subsoil in the plow layer.

This soil occurs on slopes that are widely distributed throughout the valley, but most of it is along the western side of the valley.

Use and suitability.—A considerable part of the soil is in pasture that is largely unimproved. Some is cropped, and a large part is idle or abandoned. Crop yields are low, and the pastures have a low carrying capacity.

Chiefly because this soil has been more injured by erosion, it is less suitable for crops and pasture than Waynesboro loam, eroded hilly phase. The soil is generally considered better suited to permanent pasture than to field crops. To establish and maintain good pasture, however, adequate amounts of lime and phosphorus must be applied. Under a high level of management, excellent pastures eventually can be obtained. After several years of well-managed pasture, it may be desirable to use the soil for crops on some farms. This soil is in management group 14.

Waynesboro cobbly fine sandy loam, rolling phase (5 to 12 percent slopes) (Wc).—This well-drained soil on the high stream terraces generally occurs at elevations of 75 to 150 feet above the present flood plains. The old alluvium from which it was derived was washed largely from uplands underlain by sandstone and shale, but it includes some materials from limestone. The soil differs from Waynesboro loam, undulating phase, mainly by having cobblestones and stones on the surface and throughout the profile that interfere greatly with tillage. The soil is also coarser textured, somewhat lighter colored, and more strongly sloping.

The areas are medium in size and irregular in shape. Most of them are near New Hope School and Antioch Church. They occur on the top of high terraces, the lower slopes of which are occupied by Fullerton soils.

The soil has formed under a hardwood forest of oak, hickory, maple, and yellow-poplar.

Profile description:

0 to 9 inches, brown to pale-brown or light yellowish-brown very friable cobbly fine sandy loam; upper 2 inches stained dark with organic matter.
9 to 18 inches, mixed pale-brown and yellowish-red to reddish-yellow very friable cobbly loam; strong brown to brownish yellow when crushed.
18 to 28 inches, yellowish-red to reddish-yellow friable cobbly clay loam; weak fine to medium blocky structure.
28 to 44 inches +, yellowish-red to reddish-yellow friable cobbly fine sandy clay; medium blocky structure.

The soil is medium to strongly acid and appears to have a moderate supply of mineral plant nutrients and organic matter. It is permeable to roots, air, and moisture. Rainfall is readily absorbed but only fairly well retained. The water-supplying capacity is about medium. Enough cobblestones and pebbles are scattered over the surface and throughout the soil to prevent or to interfere with tillage.

Use and suitability.—All of this soil is covered by cutover forest. The stand is thin because it has been overcut.

The droughtiness and the high content of stones make this soil only fair for cropping. The stones hinder cultivation and lower the capacity of the soil for holding water and plant nutrients.

On most farms this soil would be best used for permanent pasture. It is better suited to small grains, crimson clover, red clover, and early vegetables than to other crops. It is not well suited to late-maturing crops such as corn. The soil appears to be well suited to cotton, but is too porous and droughty for alfalfa. Most hay crops yield fairly well, if adequately fertilized, but the cobblestones make it difficult to harvest the hay. To obtain even fair yields of most crops, however, moderately heavy applications of lime and a complete fertilizer are necessary. The soil is in management group 9.

Waynesboro cobbly fine sandy loam, eroded rolling phase (5 to 12 percent slopes) (Wd).—This is a well-drained soil of the high stream terraces. Most of it occurs at elevations of 75 to 150 feet above the present flood plains of the Tennessee River. It is mainly near New Hope School and Antioch Church. The soil was derived from old alluvium that washed largely from uplands underlain by sandstone and shale. It includes some materials from limestone.

This soil differs from Waynesboro cobbly fine sandy loam, rolling phase, chiefly in being eroded. Much of the original surface layer has been lost through erosion. In some places part of the subsoil has been mixed with the surface soil in the plow layers, and that layer is now highly variable in color, texture, and thickness. All of the original surface soil is missing in a few spots, and the subsoil is exposed.

The present surface soil is a light yellowish-brown

to pale-brown very friable cobbly fine sandy loam. The subsoil is a yellowish-red or reddish-yellow friable cobbly sandy clay or cobbly clay loam.

The soil is medium to strongly acid and appears to be about medium in content of organic matter and plant nutrients. It is permeable to roots, air, and moisture. Both surface runoff and internal drainage are medium. The water-holding capacity is moderately low. The cobblestones scattered over the surface and throughout the soil interfere greatly with tillage.

Use and suitability.—Most of this soil has been used for crops and pasture. A large part is now in pasture that is largely unimproved. Some is cropped, and some is idle.

Because of droughtiness and the high content of cobblestones and gravel, the soil is only fairly well suited to crops. The cobblestones interfere with tillage and in some place prevent it. They also lower the capacity of the soil to hold water.

On many farms the soil is more suitable for permanent pasture than for other uses. It is better suited to small grains, crimson clover, red clover, and vegetables than to late-maturing crops. It is not well suited to corn or other crops that mature late in summer or early in fall. It is too porous and droughty for alfalfa. Many hay crops will make fairly good yields if adequately fertilized, but the cobblestones make harvesting of the hay difficult. The soil is deficient in lime, phosphorus, nitrogen, and potassium for some crops. Moderately heavy applications of lime and complete fertilizer are needed to obtain even fair yields. The soil is in management group 9.

Waynesboro cobbly fine sandy loam, hilly phase (12 to 25 percent slopes) (We).—This well-drained soil occurs on the high stream terraces of the Tennessee River. The soil was derived from alluvium washed chiefly from uplands underlain by sandstone and shale, but it includes some alluvial materials from limestone.

The surface soil consists of light yellowish-brown or pale-brown very friable cobbly fine sandy loam. The subsoil is reddish-yellow or yellowish-red friable cobbly clay loam or cobbly fine sandy clay. Depth to bedrock is more variable than for the rolling phase, but in most places the depth is 3 feet or more.

The soil occupies hill slopes, mainly near New Hope School and Antioch Church.

Use and suitability.—All of this soil is forested. It is poorly suited to tilled crops because of the strong slopes, high content of cobblestones, and susceptibility to erosion. Tillage is difficult, and soil and moisture are hard to conserve. The soil is fairly well suited to pasture and close-growing hay crops. It is rather low in plant nutrients, but it responds well to good management that includes proper fertilization. If cleared and used for crops and pasture, the use suitability of this soil will be similar to that for Waynesboro cobbly fine sandy loam, eroded hilly phase. This soil is in management group 13.

Waynesboro cobbly fine sandy loam, eroded hilly phase (12 to 25 percent slopes) (Wf).—This well-drained soil occupies short slopes on the high stream terraces of the Tennessee River. Most of it is near New Hope School and Antioch Church. It is associated with Fullerton soils and with other Waynesboro soils.

This soil occupies stronger slopes than those occupied by Waynesboro cobbly fine sandy loam, rolling phase. It is also somewhat shallower over the limestone residuum and is moderately eroded. Erosion has removed much of the original surface layer, and in places the yellowish-red subsoil is exposed.

The present surface soil is a light yellowish-brown to pale-brown or brownish-yellow very friable cobbly fine sandy loam to cobbly light clay loam. The subsoil is a yellowish-red or reddish-yellow friable cobbly fine sandy clay or cobbly clay loam. The underlying material is largely stratified. It consists of beds of cobblestones and clayey materials, some of which are residual.

Use and suitability.—All of this soil has been used for crops and pasture. Most of it is now in pasture that is largely unimproved. Some is cropped, and some is idle.

Chiefly because of its droughtiness and strong slopes and, because of the cobblestones, this soil is poorly suited to tilled crops. Workability is poor, and water is difficult to control. The cobblestones lower the water-holding capacity. The soil is best suited to permanent pasture and, if adequately fertilized, it should produce good forage. It is deficient in lime, phosphorus, nitrogen, and possibly potassium. This soil is in management group 13.

Whitwell loam (0 to 2 percent slopes) (Wm).—This is an imperfectly drained to moderately well drained soil. It was derived from alluvium that washed mainly from uplands underlain by sandstone. The soil occurs on the low terraces of most of the major streams of the county. The largest acreage is along the Sequatchie River, but much of the soil occurs along creeks that flow from the coves of the Cumberland escarpment. This soil is closely associated with soils of the Sequatchie, Waynesboro, Allen, Staser, Hamblen, and Prader series. It was formed under a deciduous forest that included some water-tolerant trees.

Profile description:

0 to 10 inches, pale-brown to light yellowish-brown very friable loam.
10 to 22 inches, brownish-yellow to yellowish-brown friable light clay loam; weak fine to medium blocky structure.
22 to 34 inches, brownish-yellow to yellow friable silty clay loam or clay loam mottled with light gray and strong brown; moderately developed medium blocky structure.
34 inches +, light-gray, highly mottled with strong brown and pale yellow, friable fine sandy clay to clay loam.

Limestone bedrock occurs at depths of 5 feet or more. The depth to mottling varies from 12 to 20 inches, depending upon drainage. In most places, however, either the mottling or a grayish cast occurs at depths of about 16 to 18 inches. The subsoil is slightly to moderately compact in places, but it is generally friable and does not constitute a pan layer.

The soil is medium to strongly acid and appears to be moderately well supplied with plant nutrients. Air, water, and roots penetrate the soil readily when the water table is low. The water table is within 2 or 3 feet of the surface much of the year; consequently, the root zone is limited and the soil is poorly aerated

during part of the growing season. The water-supplying capacity is high.

Use and suitability.—Most of this soil is used for pasture or crops, principally corn, oats, crimson clover, and soybeans.

Imperfect drainage limits the use suitability in many areas. The soil is well suited to corn and many hay crops but is not well suited to alfalfa. Some areas are fair for wheat, but many areas are too wet. The soil is well suited to permanent pasture. Nevertheless, in most places farmers prefer to rotate pastures because the soil is also desirable for crops. The soil is suited to intensive use under a management system that maintains the organic-matter and fertility level. Phosphorus and potassium are needed for continued high yields of most crops. This soil is in management group 5.

Wolftever silt loam, undulating phase (2 to 5 percent slopes) (Wn).—This is a moderately well drained soil on low stream terraces. The old mixed alluvium from which the soil has formed was washed from uplands underlain by many kinds of rock, but chiefly limestone. The soil has developed under a hardwood forest. It occurs along the Tennessee River in association with Taft, Robertsville, Huntington, Lindside, and Melvin soils.

A small included acreage differs in being slightly to moderately eroded. In a few places as much as 75 percent of the surface soil has been removed.

Profile description:

0 to 8 inches, brown or grayish-brown friable silt loam; 6 to 10 inches thick.
8 to 28 inches, yellowish-brown to brownish-yellow, firm, moderately compact heavy silty clay loam; 15 to 25 inches thick.
28 inches +, brownish-yellow or yellowish-brown moderately compact to moderate friable silty clay loam streaked and splotched with gray, yellow, and brown; 2 to 10 feet thick.

The soil is medium to strongly acid and moderately well supplied with organic matter and plant nutrients. The compactness of the subsoil retards the movement of water and air and restricts root penetration. Surface runoff and internal drainage are slow to medium. The water-supplying capacity is moderately low. The soil varies considerably in age and in compaction of the subsoil. Some of the broader, more nearly level areas have a very compact subsoil and are lower in productivity than the typical soil. Crops on these areas are frequently injured by drought. On some of the higher lying terraces, the soil is slightly lighter in color and the subsoil is more friable.

Use and suitability.—Practically all areas of this soil have been used for crops and pasture. Part is now used for most of the commonly grown crops, but yields are rather low. Much of the soil is idle each year.

This soil is fairly well suited to many different crops, but it is only moderately productive of most. It is easy to work and moderately easy to conserve. Because of the moderately low water-supplying capacity, crops that mature late in summer and fall are frequently damaged by lack of moisture. Most of this soil is occasionally flooded, and considerable risk is involved in growing winter crops. The soil is in management group 5.

Interpretation and Use of Marion County Soils

By grouping soils we are better able to understand how they should be used and managed. In this section the soils are grouped in three ways. In the first, the soils are placed in management groups so that suitable practices can be described for soils requiring about the same kind of management. In the second, the soils are grouped by land capability classes and subclasses, which show the relative suitability of soils for crops, grazing, forestry, and wildlife, and the relative risk of erosion or other damage. In the third, soils are grouped according to their geographic association, so that the broader patterns of soils can be more readily grasped.

Use and Management of Soils

Many farmers now practice good soil management, and their yields are much higher than the average for the county. In general, these farmers do these things (*3*):

1. Use good crop varieties that are adapted to the area.
2. Follow a crop rotation that will use the water on the land to the best advantage. This rotation, as a rule, will include legumes to add nitrogen; row crops to control weeds; deep-rooted crops to forage for nutrients in the subsoil and thereby increase permeability; and pasture, meadow, or green-manure crops to increase or maintain organic matter and improve tilth.
3. Return barnyard or green manure to the soil to maintain the supply of nitrogen and to add fresh organic matter.
4. Apply lime, phosphorus, nitrogen, or potassium, or a combination of these materials if needed. (The county agent should be consulted about testing the soil before lime or fertilizer is added.)
5. Carefully prepare the seedbed. (The practices of the better farmers of the county or the recommendations of the experiment station regarding the time and rate of planting should be followed.)
6. Use suitable measures to control weeds, insects, and diseases.

The practices listed in the foregoing are a part of good management almost anywhere. But another important part of good management is knowing the characteristics of soils and applying practices that will allow them to produce at their best now and for the years to come. In the following pages management is discussed in terms of the strong points and deficiencies of the soils.

TABLE 6.—*Suitable crops, cropping systems, and supplementary practices*[1]

Management group and soil	Suitable uses	Rotations or cropping systems	Supplementary measures for water control	Remarks
Group 1 Bruno loamy fine sand. Hamblen loam. Huntington silt loam. Huntington loam. Huntington fine sandy loam. Lindside silt loam. Staser loam. Staser fine sandy loam. Staser cobbly fine sandy loam.	Chiefly summer annual crops such as corn, soybeans, and lespedeza.	Continuous corn. Corn followed by crimson clover or corn followed by vetch. Corn, soybeans, and red clover.	Diversion ditches may be needed on some imperfectly drained soils.	Soils subject to periodic flooding.
Group 2 Barbourville loam. Barbourville stony fine sandy loam. Emory silt loam. Greendale silt loam. Greendale cherty silt loam.	Corn, soybeans, red clover, lespedeza, tobacco, and vegetables.	Continuous row crops. Corn or any row crop, lespedeza. Corn or any row crop, crimson clover. Corn, pasture for 2 or more years.	None	Some soils contain chert and stones that interfere with tillage. All soils relatively high in natural fertility, productive, and well suited to practically all crops commonly grown.
Group 3 Sequatchie loam: Undulating phase. Eroded undulating phase. Sequatchie fine sandy loam: Undulating phase. Eroded undulating phase. Sequatchie cobbly fine sandy loam: Undulating phase. Eroded undulating phase.	Corn, cotton, soybeans, tobacco, truck crops, and all hay and pasture plants common to the county. Soils moderately well suited to alfalfa.	Small grain seeded with lespedeza, crimson clover, and soybeans. Corn, a small grain, and red clover. Corn, a small grain, and alfalfa for 3 or 4 years. Cotton, a small grain, and red clover. Tobacco, crimson clover.	Contour tillage	Soils easy to work and conserve. Appear to be well suited to all crops common to the area and productive when adequately fertilized. Erosion control not a serious problem.
Group 4 Cumberland silty clay loam, eroded undulating phase. Etowah silty clay loam, eroded undulating phase. Hermitage silt loam, eroded undulating phase. Minvale silt loam, eroded undulating phase. Waynesboro loam, eroded undulating phase.	Corn, soybeans, cotton, tobacco, alfalfa, red clover, crimson clover, Ladino clover, lespedeza, small grains, and truck crops.	A small grain seeded with lespedeza, crimson clover, and soybeans. Corn or any row crop, a small grain, and alfalfa 3 or 4 years. Tobacco, crimson clover. Corn or any row crop, a small grain, and red clover.	Contour tillage	Soils desirable for crops and pasture. Productive of all the common crops if adequately fertilized. Easy to work and conserve. Water control not a serious problem.
Group 5 Capshaw silt loam: Undulating phase. Eroded undulating phase. Whitwell loam. Wolftever silt loam, undulating phase.	Grain sorghum, soybeans, corn, cotton, lespedeza, red clover, Ladino clover, vetch, fescue. Soils moderately well suited to small grains.	A small grain seeded with lespedeza, crimson clover or vetch, and soybeans. Corn or grain sorghum, a small grain, and red clover.	Contour tillage	Soils imperfectly to moderately well drained and medium to low in natural fertility. Adequate fertilization of properly selected crops is the chief problem.
Group 6 Hartsells fine sandy loam: Undulating phase. Eroded undulating phase. Pace silt loam, eroded undulating phase.	Corn, cotton, tobacco, small grains, red clover, crimson clover, truck crops, and practically all hay and pasture plants. Pace soils not well suited to alfalfa.	Corn, a small grain, and red clover. A truck crop, crimson clover. Tobacco, crimson clover. Corn, a small grain, pasture for 2 or 3 years.	Contour tillage	Soils low in natural fertility. Easy to work and not difficult to conserve. Water control is not a serious problem if other management practices are good.
Group 7 Hollywood silty clay loam. Talbott and Colbert silty clay loams, eroded undulating phases. Swaim silty clay loam, eroded undulating phase.	Red clover, crimson clover, Ladino clover, small grains, Talbott and Swaim soils suited to alfalfa.	A small grain, red clover or alfalfa for 2 or 3 years. Permanent pasture.	Subsoiling, contour tillage.	Soils poor in workability, and good tilth difficult to obtain. Can be worked only within a narrow range of moisture content.
Group 8 Crossville loam, rolling phase. Sequatchie loam, eroded rolling phase. Sequatchie cobbly fine sandy loam, eroded rolling phase.	Corn, cotton, tobacco, soybeans, truck crops, red clover, alfalfa, crimson clover, lespedeza, Ladino clover.	A small grain seeded with lespedeza, crimson clover, soybeans. Corn, a small grain, and red clover for 2 years.	Contour tillage	Soils easy to work and fairly easy to conserve except for stones on part of the Sequatchie soils.

TABLE 6.—*Suitable crops, cropping systems, and supplementary practices*[1]*—Continued*

Management group and soil	Suitable uses	Rotations or cropping systems	Supplementary measures for water control	Remarks
Group 9 Allen fine sandy loam, eroded rolling phase. Allen stony fine sandy loam, eroded rolling phase. Bolton silt loam, eroded rolling phase. Cumberland silty clay loam, eroded rolling phase. Etowah silty clay loam, eroded rolling phase. Fullerton silt loam, eroded rolling phase. Fullerton cherty silt loam: Rolling phase. Eroded rolling phase. Hermitage silt loam, eroded rolling phase. Minvale silt loam, eroded rolling phase. Minvale cherty silt loam, eroded rolling phase. Waynesboro loam, eroded rolling phase. Waynesboro cobbly fine sandy loam: Rolling phase. Eroded rolling phase.	Corn, cotton, tobacco, soybeans, alfalfa, red clover, Ladino clover, lespedeza, and small grains.	Corn, a small grain, and alfalfa for 3 or 4 years. Corn, a small grain, and red clover for 2 years. Tobacco, crimson clover. Cotton, a small grain, and pasture or hay for 2 or 3 years.	Contour tillage; some strip-cropping.	Soils should not be planted to crops requiring frequent seedbed preparation. Stones, chert fragments, or cobblestones in some of the soils interfere with tillage and lower their ability to hold water and plant nutrients.
Group 10 Capshaw silt loam, eroded rolling phase. Clarksville cherty silt loam, rolling phase. Hartsells fine sandy loam: Rolling phase. Eroded rolling phase. Jefferson fine sandy loam: Rolling phase. Eroded rolling phase. Linker loam: Rolling phase. Eroded rolling phase. Pace cherty silt loam, eroded rolling phase.	Corn or grain sorghum, cotton, tobacco, soybeans, red clover, crimson clover, Ladino clover, lespedeza, and small grains.	Corn or grain sorghum, a small grain, and mixture of Ladino or red clover with orchardgrass for 3 years. Cotton, a small grain, and mixture of Ladino or red clover with orchardgrass for 3 years. Tobacco, crimson clover. Cotton, small grain, and pasture or hay for 2 or 3 years.	Contour tillage; some strip-cropping.	Soils low to very low in natural fertility. Productive of adapted crops when properly fertilized. Enough chert in the Clarksville and Pace soils to interfere with cultivation.
Group 11 Colbert silty clay loam, eroded rolling phase. Swaim silty clay, severely eroded rolling phase. Talbott silty clay loam, eroded rolling phase. Talbott silty clay, severely eroded rolling phase.	Small grains, alfalfa, red clover, Ladino clover, grasses.	A small grain, alfalfa for 3 or 4 years. A small grain, mixture of red or Ladino clover with orchardgrass for 3 or 4 years. Permanent pasture.	Contour tillage.	Soils range from shallow to moderately deep. Workability poor, and good tilth difficult to obtain.
Group 12 Etowah silty clay loam, severely eroded rolling phase. Waynesboro clay loam, severely eroded rolling phase.	Small grains, alfalfa, red clover, Ladino clover, grasses. Permanent pasture.	A small grain, alfalfa for 3 or 4 years. A small grain, red or Ladino clover with orchardgrass for 3 or 4 years. Permanent pasture.	Subsoiling and contour tillage.	Soils should not be planted to crops requiring frequent seedbed preparation. After a few years in well-managed pasture, soils may be suited to some crops.
Group 13 Allen fine sandy loam, eroded hilly phase. Allen stony fine sandy loam: Hilly phase. Eroded hilly phase. Bolton silt loam: Hilly phase. Eroded hilly phase. Cumberland silty clay loam, eroded hilly phase. Etowah silty clay loam, eroded hilly phase.	Permanent pasture of white, Ladino, or red clover and orchardgrass; corn, small grains, alfalfa, red clover.	Corn, a small grain, clover-and-grass pasture 4 or more years. Permanent pasture.	Contour tillage, some strip-cropping on longer slopes.	Soils should not be planted to crop requiring frequent seedbed perparation. Chert fragments, stones, or cobblestones in some of the soils make tillage difficult.

TABLE 6.—*Suitable crops, cropping systems, and supplementary practices*[1]*—Continued*

Management group and soil	Suitable uses	Rotations or cropping systems	Supplementary measures for water control	Remarks
Group 13 (continued) Fullerton silt loam: Hilly phase. Eroded hilly phase. Fullerton cherty silt loam: Hilly phase. Eroded hilly phase. Waynesboro loam: Hilly phase. Eroded hilly phase. Waynesboro cobbly fine sandy loam: Hilly phase. Eroded hilly phase.				
Group 14 Allen clay loam, severely eroded hilly phase. Bolton silty clay loam, severely eroded hilly phase. Cumberland silty clay loam, severely eroded hilly phase. Etowah silty clay loam, severely eroded hilly phase. Fullerton cherty silty clay loam, severely eroded hilly phase. Waynesboro clay loam, severely eroded hilly phase.	Permanent pasture of Ladino or other white clover and orchardgrass.	Permanent pasture	Control grazing	None.
Group 15 Clarksville cherty silt loam, hilly phase. Muskingum stony fine sandy loam: Hilly phase. Rolling phase. Pace cherty silt loam, eroded hilly phase.	Permanent pasture; forest.	Permanent pasture[1] Forest.	Control grazing if pastured.	Soils cherty or stony and difficult to work. All are droughty and naturally low in fertility.
Group 16 Cotaco and Atkins silt loams. Melvin silty clay loam. Prader silt loam. Robertsville silt loam. Taft silt loam.	Pasture of Ladino or other white clover, alsike clover, fescue, and redtop.	Permanent pasture	Tiling; open ditches; diversion ditches.	All subject to flooding or ponding.
Group 17 Armuchee silty clay loam, hilly phase. Cobbly alluvium, Staser and Sequatchie soil materials. Stony hilly and rolling land, limestone.	Permanent pasture or forest.	Permanent pasture. Forest.	None	All too stony or too shallow for feasible cultivation.
Group 18 Clarksville cherty silt loam, steep phase. Fullerton cherty silt loam: Steep phase. Eroded steep phase.	Forest	Forest	None	None.
Group 19 Armuchee silty clay loam, steep phase. Bouldery colluvium, Allen soil material. Gullied land, limestone soil materials. Muskingum stony fine sandy loam, steep phase. Rockland, limestone. Rockland, sandstone.	Forest	Forest	None	None.

[1] See county agricultural agent about testing soils to determine need for amendments and for specific fertilizer recommendations.

Management groups

Soils differ in their suitability for agriculture and in the management they need. The soils of this county therefore have been placed in 19 groups. All the soils in a given group have a combination of characteristics such that they will need the same kind of management and will respond to that management in much the same way.

Table 6 lists suitable crops, crop rotations or cropping systems, and supplementary measures for water control for each management group. Each group is further discussed in the text.

For each management group there is a table showing yields to be expected under two levels of management—the prevailing management and the improved management practiced by a few farmers in the county.

In columns A of these tables are yields obtained under prevailing management, and in columns B, yields to be obtained under improved management. The average estimated yields are based on records for at least a 5-year period. The yields in columns B can be obtained by following management methods that most farmers in the county will find practical. In fact, yields higher than those given in columns B can be obtained in favorable seasons, especially if heavier fertilization is practiced. To increase yields from those shown in columns A to those in columns B will require at least two rotation cycles under the improved level of management. Frequently, higher yields are obtained than those given for the improved level of management.

The yields given in the tables are subject to change. New crop varieties and new cultural practices may increase yields, and new plant diseases or insect pests may affect them adversely.

MANAGEMENT GROUP 1

Management group 1 consists of the nearly level well-drained and imperfectly drained young soils listed in table 7. The soils are among the most fertile and productive in the county. They are well supplied with lime, organic matter, and plant nutrients, compared to the other soils. Floodwaters, which replenish the supply of plant nutrients by depositing fresh sediments, sometimes cover them for short periods during the winter and spring.

These soils are deep, friable, and readily permeable to roots, air, and moisture. Except for the Bruno soil, moisture is generally adequate for crops. Nearly all the soils are free of stones and gravelly materials. They are easy to work and to keep in good tilth. Because they are nearly level, erosion is not a problem. The floods, however, cause some scouring and shifting of soil materials.

Present use and management.—Nearly all of these soils are used intensively for crops, mainly corn and lespedeza. Grain sorghum and soybeans are grown to some extent, chiefly on the imperfectly drained soils. Less than 5 percent of acreage occupied by soils of this group is wooded. For the most part, the wooded areas occur as narrow bands on the lowest, or first, benches next to stream channels. The acreage in pastures is fairly small.

Corn, the most important crop, is grown continuously on many fields. On some it is grown for several years in succession and is followed by lespedeza for 2 or 3 years. Generally the lespedeza is grown for hay, but it is sometimes pastured before it is plowed under. Some areas of these soils, in fields that include Sequatchie, Emory, Greendale, Minvale, and Pace soils, are planted to the same crops as the adjoining soils.

Commercial fertilizers, if used at all, are applied in only small or moderate amounts. Generally no lime or manure is used. Comparatively high yields are obtained, nevertheless, without fertilizers. The soils are prepared for planting as early as possible, and tillage is done with reasonable care.

Permanent pastures are usually on poorly drained bottoms, terraces, or slopes next to these bottoms or terraces. They receive little special management and contain lespedeza alone or a mixture of various

TABLE 7.—*Soils of management group 1 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yield is given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Bruno loamy fine sand	15	25	(2)	(2)	5	10	9	25	0.4	0.7	15	35
Hamblen loam	35	55	----	----	----	(2)	----	(2)	1.1	1.6	95	130
Huntington silt loam	45	70	----	----	----	----	----	----	1.4	1.6	120	150
Huntington loam	40	65	----	----	----	----	----	----	1.4	1.6	110	135
Huntington fine sandy loam	30	50	----	----	----	----	----	----	1.2	1.4	95	115
Lindside silt loam	35	60	----	----	----	----	----	----	1.2	1.5	100	140
Staser loam	35	60	----	----	----	----	----	----	1.3	1.5	105	125
Staser fine sandy loam	27	48	----	----	----	----	----	----	1.1	1.3	90	105
Staser cobbly fine sandy loam	20	35	----	----	----	----	----	----	.5	.8	50	65

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

[2] Crop not commonly grown; soil considered suitable for it, but less suitable than for crops for which ratings are given.

grasses and legumes. The pasture plants are mixed with weeds, vines, and other vegetation common to the bottom lands. The quality and amount of forage are influenced by the amount of weeds. The weeds compete vigorously with desirable pasture plants, but they are sometimes controlled by grazing. Few farmers mow or fertilize their pastures. If grazing is controlled, weeds are not difficult to keep in check on pastures that are properly fertilized.

Use suitability and management requirements.—The soils of group 1 are well suited to intensive cropping. Their suitability for use is somewhat limited, however, by their susceptibility to flooding. Except for the Bruno soil, all are well suited to corn and summer hay. They are poorly suited to alfalfa. Though this crop is grown successfully in a few places, the soils are better suited to red clover. Many of the soils are suitable for cotton and tobacco, but these crops are usually grown on higher lying areas to avoid the risk of floods. Small grains on these soils tend to lodge, are subject to disease, and mature later than on upland soils.

Except for the Bruno soil, the soils are well suited to pasture. Nevertheless, they are seldom pastured because they are desirable for crops. Crops can be grown almost continuously, but it is better to use a short rotation. The rotation should include a legume or a legume-grass mixture. Corn should be rotated with a legume, and the legume should be cut for hay or pastured and then turned under to supply humus. In some areas it is practical to manage these soils with associated soils of the terraces. A good plan, then, would be to rotate a row crop, such as corn, with a small grain seeded with a legume.

Average yields of corn can be increased by alternating corn and lespedeza and applying a fertilizer high in phosphorus. It may be desirable to grow soybeans in the row with corn, especially if the crop is to be hogged off. At least moderate applications of a complete fertilizer would greatly increase yields, particularly on the sandier soils. Lime may be needed to increase the yield of legumes. All crops respond to the use of barnyard manure and plant residues.

MANAGEMENT GROUP 2

Management group 2 consists of the undulating, predominantly well drained, young soils listed in table 8. These soils are good to excellent for crops and pasture. All are deep and permeable. The water-supplying capacity is high to very high. The soils are ordinarily not susceptible to flooding, but a few areas of Greendale and Emory soils that occur in depressions are ponded for short periods. The content of organic matter and plant nutrients is moderately high to high. The supply is replenished from time to time by sediments, or local wash, carried down from adjacent slopes. Good tilth is easy to maintain, and the soils can be tilled within a wide range of moisture content.

Present use and management.—Because these soils generally occupy small areas in the uplands or among high terraces, their use is influenced greatly by the use of adjacent soils. They are used rather intensively for corn, wheat, oats, cotton, tobacco, lespedeza, crimson clover, and soybeans. A comparatively small acreage is used for vegetables, grown chiefly for home use. A fairly small acreage is in pasture.

Crops are generally not rotated systematically unless these soils are included in fields with other soils on which crops are rotated. The soils are generally used to grow row crops intensively. A green-manure crop, such as crimson clover or vetch and rye, follows the row crop on some farms. Many areas, however, remain idle during winter.

As a rule these soils are fertilized according to the requirements of the soils on the uplands or high terraces, as those are the soils with which they are associated. They respond well to manure, lime, and complete fertilizer. Some farmers apply 100 to 200 pounds of complete fertilizer to corn. About 200 pounds of a complete fertilizer is commonly used to fertilize wheat or oats. A few farmers topdress their wheat and oats with a nitrogen fertilizer. Truck crops receive 500 to 1,000 pounds per acre of a complete fertilizer in addition to a part of the barnyard manure.

Farmers usually till the soils promptly and carefully, and most of the plowing is done in spring. Measures

TABLE 8.—*Soils of management group 2 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yield is given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza		Alfalfa		Tobacco		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days*[1]	*Cow-acre-days*[1]
Barbourville loam	30	55	(2)	(2)	11	20	25	40	0.9	1.6	-----	(2)	1,300	1,800	70	125
Barbourville stony fine sandy loam	23	45	-----	(2)	9	16	20	32	.7	1.3	-----	(2)	950	1,400	55	100
Emory silt loam	40	70	380	500	15	23	40	60	1.2	1.8	2.0	3.0	1,700	2,200	115	145
Greendale silt loam	30	50	300	450	12	20	28	45	1.0	1.6	1.8	2.8	1,600	2,100	90	130
Greendale cherty silt loam	25	45	275	400	10	18	20	40	.9	1.4	1.5	2.1	1,100	1,800	80	120

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

[2] Crop not commonly grown; soil considered suitable for it, but less suitable than for crops for which ratings are given.

for controlling insects and diseases are generally inadequate.

Use suitability and management requirements.—The soils of group 2 can be cropped intensively and are well suited to practically all the crops commonly grown. Chiefly because they ordinarily are not susceptible to flooding, they have a wider range of suitability than the soils of group 1.

Although well suited to most of the common crops, these soils are not so well suited to alfalfa as the Cumberland and Etowah soils and other soils that have a red clayey subsoil. Small grains yield well but lodge to some extent, particularly on the Emory soil.

Good yields are obtained under almost continuous row cropping, but a short rotation would be beneficial. A good rotation is corn, wheat, and crimson clover. Red clover can be substituted for the crimson clover in this rotation, almost any row crop can substitute for the corn, and oats or barley can replace the wheat. On some areas other legumes or grasses could be substituted for the red clover, but this might require a longer rotation.

Although the soils of this group have high fertility, compared to many of the soils of the county, they respond very well to adequate fertilization. Nitrogen should be applied for high yields, even where legumes are sown. Phosphorus is also generally required for high yields of most crops. As a rule there is enough potassium, but more is required for such crops as alfalfa. These soils are not particularly low in lime, but lime would benefit most crops, especially legumes. If row crops are grown intensively, it may be necessary to add barnyard manure and to return the crop residues to the soil to maintain organic matter and good tilth.

Except in a few places, where some of the soils receive runoff from adjacent slopes, the control of runoff is not a problem. If the soils receive runoff, they may be damaged by erosion or by heavy deposits of materials washed from the higher lying areas. It may be desirable to divert the runoff on the higher slopes before it reaches these soils. Generally, tillage should be on the contour.

These soils are highly productive of pasture. They remain moist, and the pastures provide good grazing throughout hot, dry periods. If properly fertilized, the soils are well suited to a pasture mixture of orchardgrass or fescue with white clover or Ladino clover. If pastures are seeded to this mixture, phosphorus is the chief requirement, although some lime and potassium probably will be needed, especially on the Barbourville and Greendale soils. Grazing should be regulated properly and the pastures clipped occasionally to control weeds.

MANAGEMENT GROUP 3

Management group 3 consists of the undulating, well-drained, brown, very friable soils listed in table 9. The soils are good to excellent for crops and pasture. In this group are some of the most desirable soils in the county for general agricultural use. Compared to the upland soils and to other terrace soils, these soils are high in organic matter and plant nutrients. They are readily permeable to roots, air, and moisture. On a small part, there are enough cobblestones on the surface to interfere with tillage. Otherwise, the soils are easy to till and can be worked throughout a wide range of moisture content. They are moderately easy to conserve. Their water-supplying capacity is moderate to high. Except during long droughts, moisture is generally adequate for crops. Relief is nearly level to gently sloping. Consequently, the effects of erosion have generally been slight.

Present use and management.—Most of the soils in this group have been cleared and are used for crops. The forests that remain consist principally of second-growth oak but include hickory, maple, yellow-poplar, and many other kinds of trees. Corn and lespedeza are the principal crops. Others commonly grown are alfalfa, red clover, crimson clover, vetch, oats, wheat, barley, grain sorghum, soybeans, small fruits and vege-

TABLE 9.—*Soils of management group 3 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yield is given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza		Alfalfa		Tobacco		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Sequatchie loam:																
Undulating phase	40	65	325	575	17	28	32	54	1.2	1.8	1.8	2.8	1,500	2,000	85	135
Eroded undulating phase	38	63	310	550	17	27	30	53	1.1	1.7	1.8	2.8	1,450	1,900	80	128
Sequatchie fine sandy loam:																
Undulating phase	35	55	360	500	15	25	28	45	1.0	1.5	1.5	2.4	1,200	1,650	70	115
Eroded undulating phase	33	52	340	475	14	23	26	43	.9	1.4	1.4	2.4	1,175	1,600	67	110
Sequatchie cobbly fine sandy loam:																
Undulating phase	27	42	290	385	11	18	22	36	.7	1.1	-----	-----	1,050	1,500	55	90
Eroded undulating phase	26	40	280	375	10	17	21	35	.7	1.1	-----	-----	1,000	1,440	53	90

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

tables. Tobacco and cotton are grown on a few small areas.

These soils, with soils of groups 1 and 2 and adjacent upland soils, form a convenient management pattern. They can be used for general field crops, and the soils on adjacent slopes, if cleared, can be used for permanent pasture. Such a soil pattern is particularly suitable for a livestock-general farming program.

Crop rotations and management practices vary widely on these soils. Corn is grown successively on some of the areas for a number of years. On others corn is grown 2 to 4 years and then alternated with lespedeza or a lespedeza-grass mixture. On a few farms alfalfa or red clover is substituted for the lespedeza. A few farmers use a rotation consisting of a small grain seeded with lespedeza, crimson clover, and soybeans. The most common rotation, however, is corn, a small grain, and lespedeza.

A small to moderate amount of commercial fertilizer is used for corn. Tobacco, cotton, and truck crops usually receive large amounts of a high-grade fertilizer. Small grains commonly are not fertilized. Some lime is spread at intervals on fields planted to legumes, and superphosphate is generally applied to red clover and alfalfa. Cover crops such as crimson clover or vetch seeded with rye are turned under to supply organic matter and nitrogen.

No special engineering practices are used to conserve the soil on slopes. Some plowing is on the contour.

Use suitability and management requirements.—The soils of group 3 are suited to moderately intensive use for all the crops commonly grown in the county. They are moderately to highly productive and are responsive to good management.

Because they are nearly level to gently sloping, heavy farm machinery can be used. Control of erosion and conservation of soil moisture are not serious problems if crops are selected properly and the soils are fertilized adequately. Good tilth is easily maintained on these soils. Engineering devices to control erosion are generally not needed, but in places, it may be desirable to till on the contour.

On these soils proper fertilization is essential for some crops, such as alfalfa and red clover, and it may be needed for tobacco and cotton. Some crops produce fairly high yields without fertilizer. Yields increase substantially, however, if suitable fertilizers and lime are applied and appropriate rotations are used. A short rotation that extends over 2 or 3 years can be used. The rotation should include a legume. A good rotation is a row crop, a small grain, and clover for hay or pasture.

Plowing under all available barnyard manure, plant residues, and green manure or a cover crop benefits these soils greatly by adding plant nutrients and improving tilth. Row crops that follow a green-manure or legume crop that is plowed under will not need a complete fertilizer; otherwise they need moderate to heavy applications of a complete fertilizer. Moderate to heavy applications of lime and superphosphate, and possibly of potassium, will be needed for successful growth of alfalfa, red clover, or other desirable legumes. Lespedeza can be grown without using fertilizer, but yields increase greatly if fertilizer is applied. Small grains should receive moderate amounts of fertilizer if the preceding crop had only a small application.

These soils are well suited to pasture. To obtain good-quality pasture, however, at least moderate applications of lime and phosphorus are necessary. If properly fertilized, the soils are productive of orchardgrass, fescue, white, Ladino, and red clovers, lespedeza, and other pasture plants. Controlled grazing and fertilization are usually effective in controlling weeds, but mowing may be necessary.

MANAGEMENT GROUP 4

Management group 4 consists of the undulating, well-drained, friable to firm soils listed in table 10. These soils are good to excellent for crops and pasture. They are easy to work and conserve, and all have comparatively high natural fertility. Compared to the soils of the uplands, such as the Fullerton and Clarksville soils, their content of organic matter and plant

TABLE 10.—*Soils of management group 4 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza		Alfalfa		Tobacco		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Cumberland silty clay loam, eroded undulating phase	32	60	320	480	18	26	30	50	1.0	1.6	2.8	3.7	1,400	2,000	80	130
Etowah silty clay loam, eroded undulating phase	30	50	310	460	16	24	30	48	1.0	1.5	2.7	3.5	1,500	2,900	75	125
Hermitage silt loam, eroded undulating phase	30	55	300	450	16	25	30	50	1.0	1.5	2.7	3.7	1,600	2,200	75	130
Minvale silt loam, eroded undulating phase	29	53	300	425	14	23	30	48	1.0	1.4	2.0	3.4	1,275	1,950	70	120
Waynesboro loam, eroded undulating phase	25	48	290	400	12	20	25	45	.8	1.4	2.4	3.4	1,500	2,000	65	125

[1] Number of days 1 acre will graze an animal unit without injury to pasture.

nutrients is moderate to high and their moisture supply favors plant growth. Tilth is good to very good, and tillage can be carried on within a wide range of moisture content. Because of their mild slopes, the soils are not highly susceptible to erosion. All are deep enough for extensive development of plant roots. The soils are practically free of stones, though a few pebbles and cobblestones occur in some areas.

Present use and management.—Practically all of these soils have been cropped intensively. All the crops common to the county are grown, but the principal ones are corn, small grains, and hay. Cotton and tobacco are the important cash crops, but they are not grown extensively. Alfalfa is grown extensively; other hay crops are red clover, alone or mixed with timothy or orchardgrass, and lespedeza. The lespedeza is commonly sown in a small grain and used for hay or pasture. Oats and wheat are the small grains most frequently sown for harvest. Barley, rye, crimson clover, and vetch are generally grown for green manure or winter pasture, but a small acreage of crimson clover is harvested for seed. Vegetables are grown mainly for home use.

Crops ordinarily are not rotated systematically on these soils. A 3-year to 4-year rotation consisting of corn, a small grain, hay, and pasture is used by some farmers.

As a rule, corn and small grains receive only light applications of fertilizer. On many farms a fertilizer high in phosphorus is the only one used. Tobacco and vegetables, neither of which are grown extensively, receive moderate to heavy applications of a complete fertilizer and a heavy application of barnyard manure. Lime has been used to some extent, but the soils generally do not have enough lime for many crops. Alfalfa usually receives adequate applications of lime, phosphorus, and boron, but potassium must be added to many areas if alfalfa is to grow successfully.

The use of amendments varies greatly from farm to farm, both in the amount applied and in frequency of application. The farmers till the soils with reasonable promptness and care. Special practices to control runoff are not common, but if crops are rotated and adequately fertilized, special control measures are not needed. Only a little is done to protect crops from insects and disease.

Use suitability and management requirements.—The soils of group 4 are suited to all the crops commonly grown in the county, but suitable fertilizers and lime are needed to grow alfalfa and red clover successfully. The Cumberland and Etowah soils are considered the best soils in the county for alfalfa. The soils in group 4 are not so well suited to corn as those in groups 1, 2, and 3, but they are better than the upland soils such as the Fullerton and Clarksville.

These soils can be cropped fairly intensively. If otherwise well managed, they can be conserved and kept productive by rotating crops. The rotation used should include a legume, and a row crop should not be grown oftener than once every 3 years. In a rotation it should be considered that these soils are well suited to alfalfa, red clover, and other deep-rooted legumes. A rotation made up of corn, a small grain, and red clover and grass is good. Any row crop can be substituted for the corn. If a longer rotation is desired, alfalfa or lespedeza can be substituted for the red clover. Winter cover and green-manure crops are a good source of nitrogen and humus and are useful in improving tilth and conserving the supply of soil moisture.

For most crops, the soils of this group are slightly to moderately deficient in lime, phosphorus, nitrogen, and possibly potassium. The response to additions of amendments is excellent, however, on most of these soils. Moderate applications of lime and phosphorus are necessary for the best growth of alfalfa, red clover, and other deep-rooted legumes, and they greatly increase the yields of other legumes, especially lespedeza. Nitrogen is required for high yields of practically all crops except legumes and crops immediately following a legume. Nearly all crops respond well to phosphorus. The Waynesboro and Minvale soils are quite likely to be deficient in potassium for many crops, especially for the deep-rooted legumes. The other soils appear to have an adequate supply for most crops. Heavy applications of a high-grade complete fertilizer are desirable on vegetables and tobacco. Properly conserved manure is an excellent source of both nitrogen and potassium, but it should be supplemented with phosphorus to obtain a balance of plant nutrients.

Controlling erosion and conserving soil moisture are not serious problems on these soils. Engineering devices for controlling erosion generally are not needed, especially if crops are properly chosen and amendments are applied in adequate amounts. Contour tillage is desirable wherever feasible. Waterways should remain in sod.

These soils are considered excellent for pasture. They are well suited to all the pasture plants commonly grown.

MANAGEMENT GROUP 5

Management group 5 consists of the undulating, imperfectly drained and moderately well drained, very friable to firm soils listed in table 11. The soils are fair to good for crops and pasture. They are easy to work and moderately easy to conserve. All are medium to low in natural fertility. In the upper part, the soils are permeable to air, moisture, and roots. All except the Whitwell soil, however, have a slightly compacted subsoil that retards the movement of air and water. Roots penetrate the subsoil with difficulty, so the root zone is confined largely to the upper part of the profile. The Whitwell soil is permeable to roots. The root zone in that soil is also largely confined to the upper part of the profile, however, because the water table is high during periods of heavy rainfall.

The soils of this group have a medium to low water-supplying capacity and are subject to extremes in moisture content. They tend to be excessively wet during winter and spring and excessively dry during summer and fall. The content of organic matter and plant nutrients is moderate to low. All the soils are medium to strongly acid. Relief is nearly level to mildly undulating, and slopes do not exceed 5 percent.

TABLE 11.—*Soils of management group 5 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yield is given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza		Tobacco		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Capshaw silt loam:														
Undulating phase	25	45	280	400	12	20	25	40	0.8	1.3	950	1,650	70	110
Eroded undulating phase	23	42	266	380	11	18	23	40	.7	1.2	900	1,575	65	105
Whitwell loam	30	50	-----	-----	10	16	20	35	1.0	1.5	-----	-----	65	110
Wolftever silt loam, undulating phase	30	45	-----	-----	12	20	27	42	1.1	1.5	-----	-----	80	110

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

Present use and management.—Practically all of the acreage in this management group has been used for crops and pasture. The principal crops are corn and lespedeza, which grow on an estimated 65 percent of the total acreage. Other crops commonly grown are cotton, soybeans, grain sorghum, crimson clover, vetch and rye, wheat, oats, barley, redtop, orchardgrass, red clover, and Ladino clover. A fairly large acreage is idle each year, and on the idle areas the vegetation consists largely of dense stands of broomsedge. A few areas of permanent pasture made up of orchardgrass and Ladino clover have been established on the Capshaw soils. Areas of the Whitwell soil, which in many places occur next to areas of the Prader soil, are often used for the same purposes as the Prader soil. Likewise, the areas of Wolftever soil, which in many places occur next to areas of the Melvin soil, are often used for the same purposes as the Melvin soil.

Soybeans, an important cash crop on these soils, are generally sown in rows and harvested for seed. Crimson clover is normally sown alone, mainly on the Capshaw soils. It is pastured during winter and harvested for seed in spring. Vetch and rye, grown on all the soils, are turned under as a green-manure crop or harvested for seed.

Systematic rotation of well-selected crops ordinarily is not practiced on any of these soils. Usually corn is grown for 1 or 2 years and followed by lespedeza, which lasts about 2 years. A soybean crop is sometimes substituted for the corn, and a few farmers grow grain sorghum instead of corn. Sometimes a row crop is grown for several years, and then the land is left idle for 2 years.

Corn generally receives small applications of a complete fertilizer or superphosphate. As a rule lespedeza is not fertilized. Lime is sometimes spread in a field that is to be sown to a legume such as red clover. Actually, the amounts of fertilizer and lime applied, and the frequency of application, vary greatly from farm to farm. Generally, not enough fertilizer is used, and large acreages need more lime than is applied.

Use suitability and management requirements.—Soils of this group have relief favorable for the use of heavy farm machinery. Erosion control is not a serious problem, but the soils require moderately exacting management. They can be maintained, conserved, and brought to a higher level of productivity by improving management. Suitable crops should be selected for rotation, and enough amendments should be applied throughout the rotation to maintain fertility.

The soils are well suited to corn or sorghum, cotton, small grains, lespedeza, Ladino clover, and grasses. Red clover, soybeans, and some vegetables grow moderately well. Because of imperfect drainage in the subsoil, the soils are not well suited to fruit trees or to alfalfa and other deep-rooted legumes.

A 3- or 4-year rotation that includes a small grain, lespedeza, and corn is satisfactory. A longer rotation that includes Ladino clover or red clover should improve productivity. A legume should be included in the crop rotation to overcome the deficiency in organic matter and nitrogen. Wheat, barley, oats, and rye are satisfactory small grains. Grain sorghum or cotton can be substituted for corn. Crimson clover and vetch are suitable cover crops. Vetch can be successfully grown alone or with grain.

On these soils all crops need lime, barnyard manure, and a commercial fertilizer high in phosphorus. Potassium is beneficial, especially for legumes. Lime is essential if legumes are to be grown.

Practices to control erosion and runoff are not necessary if other management practices are good. If possible, however, tillage should be on the contour. A clean-cultivated crop should be followed by a cover crop. Keeping a growing crop on the soils as much of the time as possible will help to prevent leaching of nitrogen and other soluble plant nutrients.

These soils are suitable for pasture but do not yield well because they have a moderate water-supplying capacity and low fertility. Pastures will greatly improve if amendments are applied properly and a mixture of pasture plants is seeded. Lime and phosphorus are important. Suitable for seeding in pastures are redtop, fescue, white clover, Ladino clover, alsike clover, red clover, orchardgrass, and lespedeza. Grazing should be controlled, and mowing may be needed to help control weeds.

TABLE 12.—*Soils of management group 6 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza		Alfalfa		Tobacco		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days*[1]	*Cow-acre-days*[1]
Hartsells fine sandy loam:																
Undulating phase	21	48	220	425	9	18	18	38	0.7	1.5	(2)	2.9	(2)	1,900	50	125
Eroded undulating phase	20	45	200	400	9	17	17	37	.7	1.4	1.5	2.8	(2)	1,800	45	120
Pace silt loam, eroded undulating phase	20	40	195	390	9	18	20	40	.8	1.3	1.3	2.6	1,450	1,975	70	115

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

[2] Crop not commonly grown; soil considered suitable for it, but less suitable than for crops for which ratings are given.

MANAGEMENT GROUP 6

Management group 6 consists of the undulating, predominantly well drained, friable yellow soils listed in table 12. These soils are fair to good for crops and good to very good for pasture. They are easy to work and fairly easy to conserve, but they are low to very low in natural fertility. The soils are moderately deep to deep. They are permeable to air, roots, and water. The moderately well drained Pace soil is less permeable than the Hartsells soils and has a slightly lower water-supplying capacity.

The soils of this group absorb rainfall fairly well. Their water-supplying capacity is moderate, and their content of plant nutrients is low to very low. All the soils contain cobblestones, pebbles, or chert fragments, but the number in the plow layer is not great enough to interefere much with tillage.

Present use and management.—An estimated 80 percent of the acreage in this group has not been cleared. The uncleared areas consist almost entirely of Hartsells soils, and little of the Pace soil remains under forest.

Corn, cotton, small grains, and hay are the chief crops. Lespedeza, alone or mixed with grasses, is the chief hay crop, but timothy, orchardgrass, and redtop are also important. Strawberries are the main cash crop, and they are grown mainly on Hartsells fine sandy loam, eroded undulating phase. Cotton and tobacco are also important cash crops, though they are not grown extensively. The pastures ordinarily consist of lespedeza and grasses, alone or mixed.

Few farmers rotate crops systematically. A rotation of corn, a small grain, and hay is commonly used. Some farmers follow the row crop with a winter cover crop.

Tobacco, cotton, and truck crops are usually fertilized heavily. Other crops commonly are not fertilized, but a few farmers apply moderately large amounts of fertilizer for practically all crops. Tobacco generally receives 500 to 1,000 pounds of complete fertilizer per acre, and truck crops, 300 to 600 pounds. Wheat commonly receives light applications of fertilizer. Phosphorus has been applied from time to time and at varying rates, but usually in amounts not large enough for high yields. Most farmers use lime, but not enough to correct the strong acidity of most of the soils. Special practices for erosion control are not common on these soils.

Use suitability and management requirements.—Even though their relief is about the same as for the soils of groups 3, 4, and 5, the soils of group 6 require much more exacting management. Longer rotations, heavier fertilization, or both, are required. If other management practices are good, the soils can be maintained in a 3- to 4-year rotation. A longer rotation well suited to these soils is corn, a small grain, and clover and orchardgrass. Almost any of the other row crops commonly grown can be substituted for the corn in this rotation. It is important that a cover crop follow all intertilled crops.

These soils are deficient in lime, phosphorus, and nitrogen. They are also likely to be very low in potassium, which should be applied for deep-rooted legumes. The legumes, especially red clover and alfalfa, require lime and phosphorus; but if they are inoculated, nitrogen is not needed. An inoculated legume crop will generally supply enough nitrogen for the other crops in a rotation, especially if it is turned under. All crops show a good response to phosphorus. Truck crops and tobacco need a complete fertilizer. If properly conserved, manure is a good source of nitrogen and potassium, but it should be supplemented with a fertilizer high in phosphorus to obtain a balance of plant nutrients.

Good tilth is easy to maintain, and tillage can be done throughout a fairly wide range of moisture content. These soils are somewhat susceptible to erosion, but because of their mild slopes, control of runoff and erosion is not a serious problem. Tillage should be on the contour if feasible. Terraces or other engineering devices for control of runoff may be necessary on the longer slopes. Waterways should remain in sod.

These soils are suited to pasture but are productive only if they are limed and fertilized. Phosphorus is needed, and possibly potassium. Grazing should be controlled. If these practices are followed, weed control will not be difficult, but an occasional mowing may be necessary.

TABLE 13.—*Soils of management group 7 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yield is given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza		Alfalfa		Tobacco		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Hollywood silty clay loam	25	45							0.9	1.4					85	110
Swaim silty clay loam, eroded undulating phase	20	40	280	400	12	18	20	40	1.0	1.4	1.8	2.8			60	115
Talbott and Colbert silty clay loams, eroded undulating phases	17	35	155	310	11	19	17	35	.6	1.2	2.2	3.1	(2)	(2)	70	105

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

[2] Crop not commonly grown; soil considered suitable for it, but less suitable than for crops for which ratings are given.

MANAGEMENT GROUP 7

Management group 7 consists of the undulating and very plastic upland and colluvial soils listed in table 13. The soils are poor to fair for crops, but in most places they are good for pasture. Some are susceptible to erosion, and some are moderately eroded. The soils range from strongly acid to neutral and from moderately high to low in organic matter and most plant nutrients. The supply of organic matter and plant nutrients, especially of nitrogen, depends largely on the cropping system that has been practiced and on the amount of soil material lost through erosion. Bedrock is generally at depths of about 4 feet, but outcrops occur in many areas. In some places the outcrops materially interfere with tillage. Runoff ranges from slow to moderately rapid. The soils are somewhat droughty. Their water-supplying capacity is moderate to low.

Present use and management.—Most of these soils have been cleared, but a small part is still covered by a cedar-hardwood forest. Some of the cleared areas are in permanent pasture, but a considerable part is idle. Corn, oats, wheat, rye, lespedeza, soybeans, and crimson clover are the principal crops.

Crops ordinarily are not rotated systematically. Corn is commonly followed by a small grain and lespedeza. The lespedeza remains until bushes and briers appear. The soil is then plowed and again planted to corn. Oats is the chief small grain.

The use of amendments on these soils has been almost negligible. Cultivation is frequently delayed, as these soils can be tilled only within a narrow range of moisture content.

Use suitability and management requirements.—These soils are used for most of the crops commonly grown, but yields are low because of poor tilth, low fertility, and low water-supplying capacity. The Swaim and Talbott soils are fairly well suited to alfalfa if they are adequately fertilized. The Hollywood soil is better suited to Ladino clover or red clover. Small grains do better on these soils than corn or other late-maturing crops. Because these soils are difficult to till, they are better suited to semipermanent hay or pasture than to cultivated crops.

Two of the principal management problems are maintenance of good tilth and improvement of the condition of the soil so that an adequate supply of water for plants will be absorbed and retained. A cropping system is needed that will aid in checking runoff where it is rapid.

In most areas a row crop can be safely grown once in 3 or 4 years if other management requirements are met. The soils, however, are particularly well suited to row crops. A rotation fairly well suited to these soils is corn, a small grain, and red clover or lespedeza. Oats, barley, or rye can be sown on the lespedeza sod to provide winter cover and green manure. Alfalfa can be substituted for red clover by lengthening the rotation to accommodate a longer period of hay. Deep-rooted legumes are desirable to improve tilth, and to help maintain supplies of organic matter and nitrogen. Grasses should be planted with the legumes, for example, orchardgrass with alfalfa to reduce erosion. Green-manure crops, such as crimson clover, vetch, and small grains, can be used for the same purpose and to provide winter cover, which is necessary on these soils.

For a rotation such as the one suggested, lime is generally required, and phosphorus for the hay crop. Legumes are usually difficult to establish. An application of manure generally helps in obtaining a stand on eroded spots. The legume can be expected to supply part of the nitrogen for the crop following it in the rotation. Except for high-yielding legume hay crops such as alfalfa, the supply of potassium in the soils is generally adequate.

The eroded soils of this group can be tilled within only a narrow range of moisture content. Because of the high content of clay, good tilth is somewhat difficult to maintain on the uneroded soils. Contour tillage aids greatly in conserving soil moisture and soil material. Terracing is generally not advisable, and stripcropping does not appear feasible because the slopes are short and the areas are small.

Good pasture can be established and maintained on these soils. On many farms pasture is the best use for them. The pastures should be seeded to a good sod-forming mixture. If properly limed and

fertilized, a mixture of fescue or orchardgrass with white clover or Ladino clover is suitable. Scattering of droppings will improve grazing. Some potassium may be needed at long intervals. Proper fertilization and careful control of grazing will do much to check weeds, but mowing a few times each season will also be necessary.

MANAGEMENT GROUP 8

On management group 8 are the rolling, well-drained, very friable soils listed in table 14. These soils are good for crops and good to excellent for pasture. Their total extent is small compared to the extent of the soils in other management groups. Nevertheless, they are important to the agriculture of the county.

Sequatchie cobbly fine sandy loam, eroded rolling phase, has stones on the surface and throughout the profile that materially interfere with tillage. The other soils are easy to till and moderately easy to conserve.

Most of the soils have fairly large supplies of organic matter and most plant nutrients and are medium to strongly acid. Their water-supplying capacity, except during long dry spells, is medium to high. Crops usually have enough moisture. The cobbly Sequatchie soil would be somewhat droughty except for the fact that it is in a position where it gets water from higher slopes.

The soils of this group are permeable to air, roots, and water. Rainfall is readily absorbed and fairly well retained. The rolling relief favors use of heavy farm machinery. Water is not difficult to control, and if management is good, erosion is not difficult to control.

Present use and management.—In large part, these soils have been cleared of trees and are now used for crops. In wooded areas the growth consists principally of second-growth oaks, but hickory, maple, yellow-poplar, and many other trees are represented. Corn and lespedeza are the principal crops. Others commonly grown are alfalfa, red clover, crimson clover, vetch and rye, oats, wheat, barley, soybeans, grain sorghum, and vegetables. Cotton and tobacco are grown in a few small areas, but the acreage is insignificant. Crimson clover, harvested for seed, and soybeans are the main cash crops.

Except for the Crossville soil, which is on the plateau, the soils of this group form a convenient management pattern with soils of groups 1, 2, and 3. Soils of this group can be used for general field crops, and the soils on the adjacent slopes can be kept in permanent pasture. Such a soil pattern is particularly suitable for a combination of livestock raising and general farming.

Crop rotations and management practices vary widely on these soils. The crop rotation most used is corn, a small grain, and lespedeza. On some areas corn is grown a number of years in succession. Often it is grown for 2 years and in the spring, following the second corn crop, the field is sown to lespedeza. On a few farms, alfalfa or red clover is substituted for lespedeza in the rotation. A few farmers use a rotation of a small grain, lespedeza, crimson clover, and soybeans.

Small to moderate amounts of commercial fertilizer are applied to corn, and from time to time some lime is spread on fields used for legumes. Tobacco, cotton, and truck crops receive large amounts of high-grade fertilizer. Small grains ordinarily are not fertilized. Superphosphate and lime generally are applied to red clover and alfalfa. Crimson clover or vetch with rye is turned under to supply organic matter and nitrogen. The use of fertilizer varies greatly from farm to farm, both in amount and in frequency of application, but on only a few farms has fertilization been adequate. On many farms only superphosphate is used. No special engineering methods are used on the more sloping areas to conserve the soils, but in some places plowing is done on the contour. Some farmers have picked up the loose stones on the stony areas and thereby broadened the use suitability of the soils.

Use suitability and management requirements.—The soils of this group differ from the soils of group 3 chiefly in occupying stronger slopes. Their management requirements are more exacting, and they

TABLE 14.—*Soils of management group 8 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yield is given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza		Alfalfa		Tobacco		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Crossville loam, rolling phase	18	40	200	360	7	15	16	34	0.6	1.3	(2)	2.6	(2)	1,550	450	100
Sequatchie loam, eroded rolling phase	35	57	280	495	15	24	27	47	1.0	1.5	1.5	2.6	1,375	1,800	70	120
Sequatchie cobbly fine sandy loam, eroded rolling phase	24	37	250	340	9	15	20	33	.6	1.0	-----	-----	975	1,300	48	80

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

[2] Crop not commonly grown; soil considered suitable for it, but less suitable than for crops for which ratings are given.

need longer crop rotations, heavier fertilization, or both. The soils are suited to many different crops. They are moderately to highly productive and respond well to good management.

If other management practices are good, the soils can be maintained in a 3- or 4-year rotation. A longer rotation well suited to the soils is corn, a small grain, and 2 or 3 years of clover and orchardgrass. Almost any of the common row crops can be substituted for the corn. A rotation also well suited is a small grain, lespedeza, crimson clover, and soybeans. It is important that a tilled crop always be followed by a cover crop.

Although these soils are generally less highly leached than the associated upland soils, they are moderately deficient in lime, phosphorus, nitrogen, and possibly potassium. Heavy applications of lime, phosphorus, and potassium are essential if alfalfa or red clover is to grow successfully. Almost all crops respond very well to phosphorus. Except for legumes and the crops immediately following them, the soils are somewhat deficient in nitrogen. Alfalfa and potatoes are likely to need potassium. Barnyard manure is an excellent source of nitrogen, potassium, and organic matter for all crops.

In some places it may be practical to remove the larger loose stones and thus improve the workability of the soils. Although the soils are generally only moderately susceptible to erosion, tillage should be on the contour if that is practicable. Waterways should remain in sod.

In the spring or early summer pastures are good on soils of this group, but they are not so productive late in summer and early in fall. A pasture mixture well suited can be selected from bluegrass, orchardgrass, redtop, white clover or Ladino clover, red clover, hop clover, and lespedeza. The management practices most important in getting good pastures are supplying of lime and phosphorus, seeding suitable pasture mixtures, controlling grazing, scattering droppings, and mowing to remove excess herbage and to control weeds.

MANAGEMENT GROUP 9

Management group 9 consists of the deep, rolling, well-drained, friable to firm soils listed in table 15. The soils are good to very good for crops and good to excellent for pasture. They are permeable to air, roots, and water. On most of them, rainfall is readily absorbed and well retained. The water-supplying capacity ranges from moderately low for the stony soils to moderately high for the stone-free soils. The content of plant nutrients ranges from low to moderately high. Most of the soils are eroded to some extent, but none is severely eroded.

Present use and management.—These soils are very

TABLE 15.—*Soils of management group 9 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yield is given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza		Alfalfa		Tobacco		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Allen fine sandy loam, eroded rolling phase	18	40	240	350	9	17	18	35	0.6	1.2	1.8	2.8	950	1,450	55	100
Allen stony fine sandy loam, eroded rolling phase	14	30	180	280	8	14	16	30	.5	1.0	-----	-----	700	1,100	45	80
Bolton silt loam, eroded rolling phase	30	50	275	400	14	22	30	50	1.0	1.4	2.2	3.2	1,200	1,600	60	105
Cumberland silty clay loam, eroded rolling phase	28	53	290	430	15	23	27	45	.9	1.5	2.5	3.4	1,300	1,600	70	115
Etowah silty clay loam, eroded rolling phase	27	45	280	410	14	21	27	44	.9	1.4	2.5	3.3	1,225	1,650	65	115
Fullerton silt loam, eroded rolling phase	19	38	175	300	9	15	17	35	.6	1.2	1.4	2.3	900	1,150	70	100
Fullerton cherty silt loam:																
Rolling phase	(2)	38	(2)	300	(2)	16	(2)	35	(2)	1.2	(2)	2.3	(2)	1,400	(2)	100
Eroded rolling phase	18	35	150	275	8	14	15	32	.6	1.1	(2)	2.2	800	1,100	65	90
Hermitage silt loam, eroded rolling phase	25	48	275	400	13	20	25	42	.8	1.4	2.5	3.5	1,500	1,925	65	115
Minvale cherty silt loam, eroded rolling phase	23	43	225	310	11	18	24	40	.8	1.1	1.6	2.6	1,000	1,500	65	110
Minvale silt loam, eroded rolling phase	25	45	275	385	12	20	25	42	.8	1.3	1.9	3.1	1,200	1,800	65	115
Waynesboro loam, eroded rolling phase	22	43	250	370	10	18	22	40	.7	1.3	2.2	3.1	1,300	1,725	60	110
Waynesboro cobbly fine sandy loam;																
Rolling phase	(2)	33	(2)	280	(2)	15	(2)	30	(2)	1.1	(2)	1.8	-------	-------	(2)	95
Eroded rolling phase	18	30	175	250	7	14	17	27	.5	.9	-----	1.8	-------	-------	45	90

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

[2] Crop not commonly grown; soil considered suitable for it, but less suitable than for crops for which ratings are given.

important to the agriculture of the county. Most of them are used for the crops commonly grown in the area. Corn, oats, and lespedeza are the most extensively grown. A large acreage is used for pastures that have been seeded to various mixtures of such plants as orchardgrass, timothy, redtop, fescue, Ladino clover, white clover, red clover, and lespedeza. Lespedeza is the most important hay crop, but alfalfa is grown extensively, mainly on the Cumberland and Etowah soils. Tobacco and cotton are the most important cash crops, although their total acreage is small. Crimson clover, harvested for seed, is also a cash crop of some importance.

Only a few farmers rotate crops systematically on these soils. The most common rotation is made up of corn, a small grain, and hay or pasture.

Nearly all farmers fertilize tobacco fairly heavily. Tobacco also receives most of the barnyard manure. Many farmers fertilize corn and small grains, but the applications are generally light. Lime is commonly applied before a legume is planted. The use of fertilizer and lime, however, varies greatly from farm to farm, both in the amount applied and in frequency of application.

Of the soils of this group, the Allen, Fullerton, and Waynesboro have been the most neglected. Special devices to control erosion are not commonly used, nor is adequate fertilization, systematic rotation of crops, or selection of crops adapted to the characteristics of the soils. Measures to control disease and insects give only partial protection.

Use suitability and management requirements.—These soils are suited to many crops, including corn, cotton, tobacco, wheat, oats, barley, and vegetables. If properly fertilized, red clover and alfalfa can be grown successfully.

Most of the soils are moderately easy to work and conserve, but they vary in productivity. They require much more exacting management than the soils in group 4. Longer rotations, heavier fertilization, and better measures for water control are required.

The soils can be maintained under a 4- to 6-year rotation, providing other management is good. A rotation well suited to the soils is corn, a small grain, and 3 years of clover and orchardgrass. Almost any commonly grown row crop can be substituted for the corn. By lengthening the rotation, alfalfa can be used instead of the grass-clover mixture. It is important to follow tilled crops with a cover crop.

For most crops, these soils do not have enough lime, phosphorus, and nitrogen to produce high yields. The Allen, Fullerton, and Waynesboro soils are much more deficient in these plant nutrients than the other soils, and they are also likely to be very low in potassium. Truck crops, cotton, and tobacco need a complete fertilizer. All the crops respond well to applications of phosphorus. Legumes, especially alfalfa and red clover, require lime and phosphorus. If the legume is inoculated, it will not need nitrogen. An inoculated legume normally will supply enough nitrogen for crops that follow it in the rotation, especially if it is turned under. On most of the soils, the deep-rooted legumes will need potassium. Properly conserved manure is a good source of nitrogen and potassium, but it should be supplemented with a fertilizer high in phosphorus to obtain a balance of plant nutrients.

Good tilth is fairly easy to maintain, and the soils in this group can be tilled within a fairly wide range of moisture content. The chert fragments, cobblestones, or stones on some areas lower workability and increase the susceptibility to drought. These soils are moderately susceptible to erosion, but control of runoff and erosion should not be a serious problem if other management is good. Tillage should be on the contour if feasible, however, and contour stripcropping may be advisable on long slopes. Terraces or other engineering devices to control runoff should not be necessary unless a shorter rotation than the one suggested is used. Because the soils are deep, permeable, and generally regular in slope, they should be well suited to terracing if proper outlets are available. Waterways should remain in sod.

These soils are well suited to pasture. For pasture management, suitable pasture plants should be selected and supplied with amendments, chiefly lime and phosphorus. Droppings should be scattered and grazing properly controlled. When these practices are followed, weed control is not difficult, but an occasional mowing may be necessary.

MANAGEMENT GROUP 10

Management group 10 consists of the yellow, rolling, moderately deep to deep soils listed in table 16. The soils are moderately well drained to well drained. They are predominantly very strongly acid. They are very low to moderate in fertility and low to moderate in productivity. The soils are friable to very friable and have a moderate to low water-holding capacity. They can be tilled over a fairly wide range of moisture content. The Capshaw soil is the least permeable of the group.

Except for the Clarksville and Pace soils, the soils are comparatively free of stones and chert, and tilth is generally good. The Jefferson soils have some stones in places, but not enough to interfere greatly with tillage. The soils have comparatively mild slopes that range from 5 to 12 percent. Erosion has removed part of the surface layer from areas under cultivation; consequently, the heavier textured subsurface layer is exposed in places.

Except for the Capshaw and Pace soils, all of these soils have external and internal drainage that is adequate for all crops. The Capshaw soil has a heavy subsoil that interferes with downward movement of water and restricts penetration of roots.

Present use and management.—The Hartsells, Jefferson, and Linker soils occupy large areas on the Cumberland Plateau. Practically all of their uneroded phases and the Clarksville soil are still forested, chiefly with oak and hickory. The timber has been cut over, grazed, and burned over to such extent that it is of poor quality and of little market value.

The eroded rolling phases of the Hartsells, Jefferson, and Linker soils are used mainly to grow corn and lespedeza, though some small grains, alfalfa, and truck crops, chiefly strawberries, are grown. Lime and fertilizers seldom are used, and yields are low.

TABLE 16.—*Soils of management group 10 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yields are given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza		Alfalfa		Tobacco		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Capshaw silt loam, eroded rolling phase	20	38	240	340	10	17	20	38	0.6	1.1	-----	-----	800	1,400	60	95
Clarksville cherty silt loam, rolling phase	----	----	----	----	----	----	----	----	----	----	----	----	----	----	(2)	50
Hartsells fine sandy loam:																
Rolling phase	(2)	43	(2)	385	(2)	16	(2)	35	(2)	1.4	(2)	2.7	(2)	1,650	(2)	115
Eroded rolling phase	18	40	200	360	7	15	16	34	.6	1.3	1.4	2.6	(2)	1,550	45	100
Jefferson fine sandy loam:																
Rolling phase	(2)	38	(2)	385	(2)	15	(2)	35	(2)	1.2	(2)	2.5	(2)	1,675	(2)	100
Eroded rolling phase	18	35	200	350	9	14	18	32	.5	1.1	1.2	2.3	850	1,600	45	90
Linker loam:																
Rolling phase	(2)	47	(2)	420	(2)	18	(2)	38	(2)	1.5	(2)	3.0	(2)	1,750	(2)	125
Eroded rolling phase	20	43	220	400	10	17	19	36	.7	1.4	(2)	2.9	(2)	1,675	50	125
Pace cherty silt loam, eroded rolling phase	16	30	150	300	7	14	15	30	.5	1.0	1.0	2.1	1,150	1,575	55	90

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

[2] Crop not commonly grown; soil considered suitable for it, but less suitable than for crops for which ratings are given.

The other soils of group 10 are used mainly to grow corn, cotton, annual hay, and wheat, oats, and other small grains. Lespedeza and soybeans are the principal legumes. Little alfalfa is grown on any of these soils. The acreage in oats is large, and some rye is grown. Rye and vetch are commonly grown together as a winter cover crop and to provide green manure. Tobacco is grown to a small extent on the Pace soil, and a small part of the eroded rolling phase of Capshaw silt loam is planted to cotton. Cotton, tobacco, and truck crops are the chief cash crops, but their combined acreage is small.

Crops are generally not grown in a systematic rotation, and the use of lime and fertilizers varies greatly from farm to farm.

Some farmers fertilize cotton with 200 to 400 pounds of a complete fertilizer. On some farms wheat receives 200 to 350 pounds of a complete fertilizer, but small grains ordinarily are not fertilized. Corn generally receives 100 to 150 pounds of a complete fertilizer or superphosphate. The fertilizer is applied in the row. From 2 to 3 tons per acre of lime is usually applied preceding a legume crop such as red clover or alfalfa. The soils generally have not received enough lime to correct their strong acidity. The amount of all amendments applied is insignificant compared to the needs of the soils.

Plowing is usually done in spring, and tillage is generally timely and adequate. Some farmers use shallow plowing on the Hartsells soils, as they believe these soils will not dry out so rapidly as when plowed deep.

Use suitability and management requirements.—Soils of this group are suited to corn, wheat, oats, barley, cotton, vegetables, and many other crops, but the impeded internal drainage of the Capshaw and Pace soils restricts their use suitability. If properly fertilized, legumes such as red clover will grow satisfactorily. Alfalfa can be grown successfully on all the soils of this management group if fertility is maintained at a high level. Most of the soils probably are better suited to small grains or cotton than to corn. They are well suited to pasture.

These soils require more exacting management than those of group 6 because they have stronger slopes and have lost somewhat more material through erosion. The rotation will need to be longer and should have a greater proportion of close-growing crops.

The soils can be maintained in a 3- to 6-year rotation if other management practices are good. A 3-year rotation made up of corn, a small grain with crimson clover, and a small grain with lespedeza is suitable. Corn, followed by 2 or 3 years of a small grain and lespedeza, is also well suited. Cotton, soybeans, or grain sorghum can be substituted for corn in these rotations. Vetch and crimson clover can be planted between the rows of cotton for winter cover or as green-manure crops. Another rotation well suited to these soils, if a high level of fertility is maintained, is corn, a small grain, and 4 years of alfalfa. The Capshaw, Clarksville, and Pace soils are not suited to alfalfa, however. It is important that a cover crop follow all row crops.

These soils are similar to the soils of group 6 in fertilizer requirements, but they generally need somewhat heavier applications. They are all deficient in lime, phosphorus, potassium, and nitrogen, although in varying degrees. The legumes, if inoculated, normally will supply enough nitrogen for the crop following in the rotation. Nevertheless, heavy applications of a complete fertilizer are needed for truck crops and potatoes.

Good tilth is easy to maintain on these soils. They are susceptible to erosion, but control of runoff and erosion should not be difficult if rotations such as those suggested are used and fertilization is adequate. All tillage should be on the contour. Stripcropping may be advisable on the long slopes.

These soils are well suited to pasture, but to produce high-yielding pastures, moderate to large amounts of lime and phosphorus must be used and suitable pasture plants selected. Also, moderate applications of fertilizers high in nitrogen and potassium probably will be needed to establish the pasture stand. Grazing should be controlled and the pastures mowed occasionally to help keep down weeds. A mixture of white clover or Ladino clover with orchardgrass can be grown if properly fertilized. Lespedeza and redtop are more suitable legumes for areas that are low in fertility.

MANAGEMENT GROUP 11

Management group 11 consists of the rolling, very plastic, shallow or moderately shallow soils listed in table 17. The soils differ from those of group 7 mainly in having stronger slopes, which range from 5 to 12 percent. They are also more eroded and somewhat shallower over bedrock. About 60 percent of the total acreage is severely eroded. Erosion has removed most of the original surface layer and, in places, a part of the subsoil. Shallow gullies are common, and limestone bedrock outcrops in many places.

All the soils are fine textured and are low in fertility. They are medium acid to strongly acid. Their content of organic matter and plant nutrients has been greatly lowered by erosion. On most of the soils, runoff is rapid. Water penetrates the soils rather slowly, and movement of moisture and air within the soils is slow. In soils other than the Swaim, plant roots penetrate the dense subsoils with difficulty. The soils are difficult to till and conserve, and good tilth is hard to maintain. The soils can be tilled within only a narrow range of moisture content. Because they are rolling and slowly permeable, they are highly susceptible to further erosion.

Present use and management.—Practically all of these soils were cultivated for many years. Now a large part is idle, and the vegetation consists of sparse stands of broomsedge, brush, and weeds. The soils are pastured in places, but the grazing is poor. The most extensive use is for lespedeza or pasture. In a few areas, corn, small grains, and crimson clover are grown.

No consistent crop rotation is followed on these soils, but corn is generally alternated with lespedeza. Some farmers grow a small grain after corn. Corn is grown on some areas for several years, and then the soils remain idle for a similar period. Cash crops are not generally grown. The few small areas of crimson clover are usually pastured during the winter and harvested for seed in the spring. No tobacco is grown on any of the soils, but on the Swaim soil, cotton is grown in a few small areas.

Corn usually receives a light application of a commercial fertilizer, normally superphosphate. Cotton is fertilized rather heavily with a high-grade fertilizer. The soils receive little, if any, barnyard manure. Few cropped areas have been limed, and pastures receive no fertilizer or lime. No special practices are followed for controlling erosion, but farmers till on the contour.

Use suitability and management requirements.—These soils are poor for tilled crops. On most farms they should be used for permanent pasture or to grow hay. Under proper management, practically all the common pasture and hay plants can be grown fairly successfully.

On these soils, deep-rooted plants are more desirable than shallow-rooted ones, because they help to improve tilth and can utilize the moisture and plant nutrients deep in the subsoil. With proper fertilization, alfalfa and red clover can be grown satisfactorily. These soils are well suited to a mixture of orchardgrass and red clover, which can be used for hay or pasture.

These soils respond well to amendments, particularly superphosphate. On all of them barnyard manure can be used to advantage as a source of nitrogen and potassium and to increase the content of humus.

TABLE 17.—*Soils of management group 11 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yield is given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza		Alfalfa		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Colbert silty clay loam, eroded rolling phase	----	----	----	----	----	----	----	----	0.3	0.6	----	----	30	60
Swaim silty clay, severely eroded rolling phase	11	27	150	220	6	10	11	22	.5	.8	1.0	1.7	32	65
Talbott silty clay loam, eroded rolling phase	15	32	140	280	9	17	15	30	.5	1.0	2.0	2.9	65	95
Talbott silty clay, severely eroded rolling phase	----	----	100	175	(2)	11	9	20	.3	.6	(2)	1.7	38	55

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

[2] Crop not commonly grown; soil considered suitable for it, but less suitable than crops for which ratings are given.

TABLE 18.—*Soils of management group 12 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yield is given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza		Alfalfa		Tobacco		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Etowah silty clay loam, severely eroded rolling phase	15	28	160	280	8	14	15	30	0.5	0.8	1.5	2.1	-------	-------	40	75
Waynesboro clay loam, severely eroded rolling phase	----	28	100	225	(2)	12	(2)	25	.3	.8	(2)	1.8	-------	-------	30	75

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

[2] Crop not commonly grown; soil considered suitable for it, but less suitable than for crops for which ratings are given.

Manure also helps in starting plants, especially on areas where the surface layer has been removed by erosion. Lespedeza can be grown without using amendments, but yields greatly increase if they are used. Controlling runoff is important. Grazing should be carefully controlled, because in wet weather the sod is injured easily by the animals' hoofs, and in hot dry weather, the stand may be killed by overgrazing. Mowing probably will be necessary to control weeds.

MANAGEMENT GROUP 12

Management group 12 consists of the severely eroded rolling, well-drained, friable to firm soils listed in table 18. Erosion has removed most of the original surface layer from these soils and, in many places, a part of the subsoil. Shallow gullies are common. Limestone bedrock outcrops in a few places, though the soils are generally 5 feet or more in thickness.

These fine-textured soils are medium acid to strongly acid. They are moderate to low in fertility. The content of organic matter and plant nutrients and the water-supplying capacity have been greatly lowered by erosion. Good tilth is difficult to maintain, and the soils can be tilled within only a narrow range of moisture content. The soils occupy slopes of 5 to 12 percent. Because of their rolling relief and the moderately slow infiltration of moisture, they are susceptible to further erosion.

Present use and management.—Soils of this group have all been used for pasture and crops. A small part is now idle or in unimproved pasture. The soils generally occupy small areas in fields that consist mainly of less eroded soils, and usually they are used for the same purposes as the less eroded soils. Corn, small grains, cotton, and semipermanent hay are the principal crops. Lespedeza, crimson clover, and alfalfa are also grown. The lespedeza is generally grown for pasture, the crimson clover for green manure and seed, and the alfalfa for hay.

Crops generally are not rotated systematically. A few farmers rotate crops on a field, without regard to the severely eroded areas. Lime and fertilizer normally are applied to a field, but more manure is used on the severely eroded areas. In establishing alfalfa, lime and phosphorus are added to the soils. Alfalfa needs boron, which is now applied more frequently than in the past.

Tillage is generally adequate, but not so timely as on some soils, because these soils can be worked within only a narrow range of moisture content.

Use suitability and management requirements.—These soils have limited suitability. They are poor for row crops but fair for pasture, small grains, and deep-rooted legumes. For most crops, they are deficient in nitrogen and phosphorus, and they generally do not have enough potassium for alfalfa. Manure will supply plant nutrients and will improve the tilth and the water-absorbing properties of the soil.

Management should include practices that will improve tilth and increase the ability of the soils to absorb water. Practices for control of runoff and erosion are also needed. It is important to choose suitable crops and rotations, to add organic matter to the soils, and to till carefully. A row crop grown on these soils should be followed by a cover crop.

A mixed stand of deep-rooted legumes and grasses will improve tilth and will help to maintain organic matter and nitrogen. Alfalfa and sericea lespedeza are good crops for this purpose. Crimson clover, vetch, and sweetclover, grown as green-manure crops, are also satisfactory.

One of the better cropping systems consists of corn, a small grain, and 4 or 5 years of a legume or a legume-grass mixture. This rotation is generally not desirable, however, until the productivity of the soils has been restored by adding organic matter and plant nutrients. Use of this rotation will depend on the type of farming, the amount of arable soils available, and the availability of necessary equipment. Another cropping system suitable for these soils is a 1-year rotation of a small grain and lespedeza.

If a 6-year rotation consisting of corn, a small grain, and 4 years of alfalfa is used, the soil should be limed and a complete fertilizer applied following the small grain. A fertilizer high in phosphorus and potassium, applied after the second year of alfalfa, will help in maintaining the alfalfa crop. Alfalfa should receive 15 to 20 pounds of borax an acre as a topdressing every year.

Tillage should be on the contour wherever feasible.

It is desirable to have a close-growing crop on the soils most of the time. If the soils are tilled in the fall, a cover crop is needed to protect them during the winter. In the spring the cover crop should be turned under to supply organic matter to the soils.

Good tilth is somewhat difficult to maintain until organic matter is incorporated in the soils. Cultivation should be kept at a minimum. To maintain tilth, the soils should be tilled only when the moisture content is favorable.

It is difficult to establish new pastures, largely because the soils are low in content of organic matter and in such poor tilth that they absorb moisture slowly and tend to clod and bake. The soils require lime and phosphorus, and potassium may be necessary. Nitrogen will help in establishing the pasture plants. Barnyard manure is helpful in establishing plants on the galled areas. A good practice is to seed alfalfa or sericea lespedeza on soils that have been properly fertilized, graze the stand after it is well established, and then seed a pasture mixture such as fescue and whiteclover in the stand of alfalfa or lespedeza.

MANAGEMENT GROUP 13

Management group 13 consists of the hilly, well-drained, friable to firm soils listed in table 19. Except for having slopes ranging from 12 to 25 percent, they resemble the soils of group 9. They are fair to poor for crops and very good for pasture. They are deep and permeable but vary greatly in productivity and natural fertility. The Cumberland soil, for example, is high in organic matter and plant nutrients, compared to the Fullerton soils.

On an estimated 65 percent of the acreage, stones, chert fragments, or cobblestones interfere with but do not prevent tillage. All the soils absorb water readily. The water-supplying capacity ranges from moderately low in the stony soils to moderately high in the soils free of stones.

Present use and management.—An estimated 50 percent of the acreage in this group has been cleared. The cleared areas are used for pasture or for many kinds of crops, including corn, small grains, and hay. Many areas are idle, temporarily abandoned, or in unimproved pasture. An estimated 15 percent is in permanent pasture.

Tobacco, cotton, and truck crops are grown, but not extensively. Oats or a mixture of wheat and oats are the small grains generally grown. The legumes are lespedeza, red clover to some extent, and alfalfa on small acreages. The red clover and lespedeza are usually grown in mixtures with redtop, timothy, and orchardgrass and are used for hay and pasture.

The permanent pastures consist largely of various mixtures of plants, mainly orchardgrass, bluegrass, redtop, lespedeza, Ladino clover, white clover, red clover, and wild grasses. Many pastures consist of lespedeza alone or lespedeza mixed with wild or volunteer plants.

Areas not used for permanent pasture are planted

TABLE 19.—*Soils of management group 13 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yield is given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza		Alfalfa		Tobacco		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Lb.*	*Lb.*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Allen fine sandy loam, eroded hilly phase	15	32	190	280	8	15	15	28	0.5	1.0	1.4	2.2	-------	(2)	45	80
Allen stony fine sandy loam:																
Hilly phase	(2)	28	(2)	270	(2)	13	(2)	25	(2)	.9	-----	-----	-------	(2)	(2)	75
Eroded hilly phase	13	26	150	230	7	11	13	25	.4	.8	-----	-----	-------	(2)	40	65
Bolton silt loam:																
Hilly phase	(2)	43	(2)	330	(2)	18	(2)	42	(2)	1.2	(2)	2.7	(2)	1,200	(2)	90
Eroded hilly phase	23	40	220	320	11	17	21	40	.8	1.1	1.8	2.6	1,060	1,150	50	85
Cumberland silty clay loam, eroded hilly phase	23	42	225	340	11	19	22	38	.7	1.3	2.0	2.9	1,000	1,150	55	100
Etowah silty clay loam, eroded hilly phase	22	38	240	320	11	17	22	36	.7	1.2	2.0	2.7	975	1,275	53	95
Fullerton silt loam:																
Hilly phase	(2)	30	(2)	265	(2)	13	(2)	29	(2)	1.1	(2)	2.0	(2)	1,250	(2)	85
Eroded hilly phase	16	29	150	250	7	12	14	27	.5	1.0	1.1	1.8	800	1,175	60	80
Fullerton cherty silt loam:																
Hilly phase	(2)	32	(2)	240	(2)	13	(2)	28	(2)	1.0	(2)	2.0	-------	-------	(2)	80
Eroded hilly phase	15	28	130	210	6	11	12	26	.4	.9	-----	(2)	-------	-------	50	75
Waynesboro loam:																
Hilly phase	(2)	36	(2)	320	(2)	16	(2)	35	(2)	1.1	(2)	2.6	(2)	1,350	(2)	95
Eroded hilly phase	16	34	200	300	8	15	16	31	.5	1.0	1.8	2.5	900	1,275	50	90
Waynesboro cobbly fine sandy loam:																
Hilly phase	(2)	27	(2)	230	(2)	12	(2)	24	(2)	.8	(2)	1.6	(2)	-------	(2)	75
Eroded hilly phase	14	23	155	210	7	11	15	23	.5	.7	(2)	1.4	-------	-------	35	70

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

[2] Crop not commonly grown; soil considered suitable for it, but less suitable than for crops for which ratings are given.

to row crops about every 3 to 5 years. Systematic rotations normally are not used, but corn generally is followed by a small grain and 2 years or more of hay and pasture. A few farmers are successful in seeding a small grain in contour furrows and following it with lespedeza.

Moderately large amounts of a complete fertilizer are applied to tobacco and truck crops. These crops generally receive most of the barnyard manure on farms where they are grown. Corn and small grains are commonly fertilized. The applications are generally light. Frequently, phosphorus is applied alone. Small grains usually receive more fertilizer than the corn. The use of phosphorus on hay and pasture has increased. Lime has been applied to many areas. Before seeding legumes such as red clover and alfalfa, lime is generally used with a moderate initial application of a fertilizer high in phosphorus and potassium.

Some tillage is on the contour. Otherwise, no methods are used to control erosion on areas used for tilled crops.

Use suitability and management requirements.—These soils have fair suitability for corn, small grains, cotton, tobacco, and vegetables. If properly fertilized, alfalfa and red clover can be grown successfully. The soils are difficult to conserve, however, and this limits the kinds of crops that are suitable and how frequently they can be grown. Also, many of the soils contain stones that make them more difficult to cultivate and decrease their ability to hold water and plant nutrients.

Most of these soils require exacting management. They need careful tillage, proper and adequate fertilization, and long rotations that consist chiefly of close-growing crops. Suitable for most areas is a rotation made up of corn, a small grain, and 4 years of a mixture of red or Ladino clover with orchardgrass. A rotation of barley or some other small grain with 3 years of red or Ladino clover and orchardgrass gives greater protection from erosion.

In varying degrees, these soils are deficient in lime, phosphorus, and nitrogen. The Allen, Fullerton, and Waynesboro soils are more deficient in these elements than the other soils, and they are also low in potassium for most crops. The legume crops, especially red clover and alfalfa, require lime and phosphorus, but if they are inoculated, they do not need nitrogen. Potassium may also be needed for the deep-rooted crops and for Irish potatoes. All crops respond well to fertilizers high in phosphorus. Heavy applications of a complete fertilizer are required for truck crops, cotton, and tobacco.

Good tilth is easy to maintain. The soils can be tilled within a wide range of moisture content, but tillage is rather difficult on the stony areas. If the large stones could be picked up, the use suitability of the soils would be broadened. Runoff and the resulting erosion are difficult to control. Losses from erosion can be kept down by using a long rotation consisting chiefly of close-growing crops and by tilling on the contour. Contour stripcropping may be advisable on the longer slopes. Waterways should remain in sod.

These soils are well suited to pasture. On many farms pasture is probably their best use. Suitable pasture plants should be selected and supplied with amendments, chiefly lime and phosphorus. Grazing should be controlled so as to maintain a good sod at all times. If these practices are followed, weed control is not difficult, but it may be necessary to mow occasionally.

MANAGEMENT GROUP 14

Management group 14 consists of the hilly, well-drained, friable to firm soils listed in table 20. Except that they are severely eroded, the soils resemble the soils of group 13. Erosion has removed most of the original surface layer and, in many places, a part of the subsoil. Shallow gullies are common. Although the soils are generally 3 to 5 feet or more in depth, bedrock outcrops occur in a few places. Erosion has greatly lowered their content of organic matter and plant nutrients and decreased their water-holding capacity. Good tilth is difficult to maintain, and the soils can be worked only within a narrow range of moisture content. The soils are strongly to very strongly acid, medium to low in plant nutrients, and

TABLE 20.—*Soils of management group 14 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yield is given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Wheat		Oats		Lespedeza		Alfalfa		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Allen clay loam, severely eroded hilly phase	9	20	5	9	10	19	0.3	0.6	0.8	1.4	25	50
Bolton silty clay loam, severely eroded hilly phase	14	26	6	11	14	26	.5	.7	1.1	1.6	30	60
Cumberland silty clay loam, severely eroded hilly phase	13	24	5	10	13	24	.4	.9	1.1	1.6	35	70
Etowah silty clay loam, severely eroded hilly phase	13	24	5	10	13	24	.4	.9	1.1	1.6	32	60
Fullerton cherty silty clay loam, severely eroded hilly phase							.3	.6			25	45
Waynesboro clay loam, severely eroded hilly phase	13	24	5	10	13	24	.3	.7		1.5	30	60

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

very low in organic matter. Because of rapid runoff and the rather slow infiltration of water, the water-supplying capacity is low.

The Fullerton soil has chert fragments that materially interfere with tillage; the other soils are practically free of stones.

Present use and management.—All of these soils have been used for crops and pasture. Now, most of the areas are in unimproved pasture or idle. A considerable acreage is abandoned, and some areas are still cropped. Small grains and lespedeza are the chief crops, but some attempts have been made to grow corn and cotton. Tobacco is not commonly grown, and the soils are not considered suitable for it.

The present management varies considerably. A few farmers lime, fertilize, and use a systematic rotation. The soils are generally cropped as long as they will produce. They are then abandoned or put in pasture. Terracing and stripcropping are not practiced, and the soils are not tilled on the contour. The timeliness and adequacy of tillage vary greatly from farm to farm.

Use suitability and management requirements.—Because of poor tilth, strong slopes, and extreme susceptibility to further erosion, these soils are poorly suited to tilled crops. On most farms they should be used for pasture.

Established pastures need lime and phosphorus. They should be mowed to control weeds. Pastures generally improve with age if they are adequately fertilized, grazing is properly controlled, and weeds are eradicated.

Pastures are difficult to establish. Tilth is unfavorable. The soils tend to clod and bake, and they absorb moisture slowly. They are extremely low in organic matter. Lime and phosphorus must be added, and potassium may be required. Nitrogen will aid in establishing desirable pasture plants.

Areas to be used for pasture should be properly fertilized and seeded with a mixture of orchardgrass and alfalfa or sericea lespedeza. They should not be grazed until the pasture is well established. After they have been grazed for a time, the pastures should be reseeded. Barnyard manure is beneficial in establishing pasture on galled areas.

Management is exacting for tilled crops. A cover crop should be maintained most of the time. Row crops should not be grown. Biennial or perennial close-growing crops should be selected rather than annual crops that require preparation of the seedbed each year. Rotations should consist mainly of grasses and legumes. It is essential that tillage be on the contour. It is best to stripcrop where feasible. Because of the strong slopes and slowly permeable subsoils, terracing is not likely to be feasible, but contour ditches or diversion ditches may be beneficial in some places. For satisfactory growth of tilled crops, fertilizers and lime are necessary, and organic matter must be added.

MANAGEMENT GROUP 15

Management group 15 consists of the shallow, predominantly hilly and excessively drained, very friable soils listed in table 21. The soils are low in natural fertility and are poor for crops and fair to poor for pasture. Their content of organic matter and plant nutrients is low. The soils are strongly acid. Their water-supplying capacity is low, and they are droughty. They absorb water readily and are permeable to roots, air, and moisture. The development of roots is restricted, however, by the shallowness of the soils. The Muskingum soils are especially shallow. Loose stones, pebbles, or chert fragments are on the surface and throughout the soil profile. The stones interfere with tillage and, in places, almost prevent it. Bedrock outcrops are common. Slopes range from 5 to 25 percent but are mostly in the upper part of this range.

Present use and management.—Except for the inextensive Pace soil, most of these soils are still under forest. Less than 200 acres has been cleared and cropped. The Pace soil has been cropped, but most of it is now in pasture that is largely unimproved. A few small areas are planted to corn, and some lespedeza is grown. Alfalfa and tobacco are not commonly grown, and the soils are not considered suitable for them.

Little marketable timber remains. All of the forests have been cut over, burned over, and grazed. The stand is thin and consists largely of cull trees. Black-

TABLE 21.—*Soils of management group 15 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yield is given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Cotton		Wheat		Oats		Lespedeza	Pasture		
	A	B	A	B	A	B	A	B	A	A	A	B
	Bu.	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Clarksville cherty silt loam, hilly phase											(2)	40
Muskingum stony fine sandy loam:												
Hilly phase											(2)	40
Rolling phase											(2)	65
Pace cherty silt loam, eroded hilly phase		22		200		12	(2)	22	0.3	0.9	45	80

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

[2] Crop not commonly grown; soil considered suitable for it, but less suitable than for crops for which ratings are given.

gum, oak, hickory, and shortleaf pine are dominant. The soils have received no fertilizer or lime.

Use suitability and management requirements.—These soils are generally closely associated with soils poorly suited to agriculture, and in many places they are surrounded by them. This has influenced the extent to which the soils have been cleared and cultivated. Suitability for crops is restricted also by stoniness, shallowness, strong slopes, low water-supplying capacity, and by low natural fertility.

The soils of group 15 are not suitable for row crops. They are better suited to permanent pasture or forest. The Pace soil is suitable for pasture, but a high level of management is needed to maintain satisfactory pasture on the Clarksville and Muskingum soils.

Pasture management consists chiefly of supplying amendments, regulating grazing, and controlling weeds. Lime and phosphorus are necessary to get good pastures on any of these soils. Nitrogen may be needed in starting new pastures, and it may be needed on established pastures that have a low proportion of legumes. If the soils are properly fertilized, they are suited to bluegrass, fescue, orchardgrass, redtop, white clover, hop clover, and lespedeza. Weed control is difficult unless grazing is regulated and the soils are fertilized. Where feasible, reseeding should be done in alternate contour strips.

MANAGEMENT GROUP 16

Management group 16 consists of the poorly drained or imperfectly drained soils listed in table 22. These soils are poor for crops but fair to good for pasture. They occupy nearly level to slightly depressed areas. The water table is at the surface or near it much of the time, and practically all the areas are sometimes flooded or ponded. The Cotaco, Atkins, Robertsville, and Taft soils are low in fertility and are strongly to very strongly acid. The Melvin and Prader soils vary in fertility and reaction but are generally much more fertile than other soils of the group.

Present use and management.—Most of the soils of this group are pastured. Many areas are under forest but are pastured to some extent. The pastures are generally unimproved and provide little forage. The Cotaco and Atkins soils are almost entirely under forest. They have not been cleared, chiefly because they are so low in productivity and are so isolated. Also, they are associated with areas of Muskingum soils that are mainly under forest. A small proportion, but a considerable acreage, of these soils is used for crops, chiefly sorghum, soybeans, corn, and lespedeza. Wheat is seldom grown because of flooding or ponding in winter. Yields of corn are low, and complete crop failures are common. Cotton, oats, alfalfa, and tobacco are not commonly grown, and these soils are not considered suitable for them.

Amendments are seldom used and crop rotation is not practiced. Attempts to drain some areas by open ditches have met with varying degrees of success.

Use suitability and management requirements.—Unless drainage is improved, these soils are poor for tilled crops. They are suitable for pasture but except for the Prader and Melvin soils are very low in productivity for pasture plants. These soils would be improved by artificial drainage. If adequately drained they would be suitable for row crops. It would be difficult to drain the Robertsville and Taft soils, however, and probably impractical.

The pastures supply a fair amount of forage through spring, summer, and fall, but the quality is poor to fair. Pasture improvement should start with drainage, which can be improved considerably, in most places, by using bedding and open ditches and diversion ditches. Tiling would probably be effective on the Cotaco, Atkins, Melvin, and Prader soils, but not on the Robertsville and Taft soils because of the hardpan underlying them. After drainage has been improved, fescue, white clover, Ladino clover, alsike clover, redtop, and lespedeza do fairly well, especially if lime and phosphorus are used where needed. Redtop and lespedeza can be grown without amendments, but the pastures are of lower quality. Weeds should be controlled by grazing and mowing.

Although poorly suited to row crops, these soils are fair for sorghum, soybeans, and other crops that can be planted late in spring or early in summer and harvested in fall. If they are effectively drained, management of the Melvin and Prader soils would be like that of the imperfectly drained soils of group 1.

TABLE 22.—*Soils of management group 16 and their average expected acre yields under prevailing management (A), and under a high level of management (B)*

[Yields based on a 5-year period; where no yield is given, the crop is not commonly grown, and the soil is not considered suitable for it under the management specified]

Soil	Corn		Lespedeza		Pasture	
	A	B	A	B	A	B
	Bu.	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Cotaco and Atkins silt loams	15	40	0.4	0.9	50	100
Melvin silty clay loam	15	40	.5	1.3	50	120
Prader silt loam	14	35	.5	1.1	45	110
Robertsville silt loam	----	----	.3	.8	30	75
Taft silt loam	20	35	.5	1.0	45	80

[1] Number of days 1 acre will graze an animal unit without injury to the pasture.

MANAGEMENT GROUP 17

Management group 17 consists of the following hilly, very plastic, shallow mapping units:

Armuchee silty clay loam, hilly phase. Cobbly alluvium, Staser and Sequatchie soil materials. Stony hilly and rolling land, limestone.

The mapping units in this group are extremely difficult to work and conserve. They are poor for crops and fair for pasture. They vary widely but have some characteristic, or combination of characteristics, that precludes use for tilled crops. Among these are stoniness, steep slopes, and shallow depth. Slopes range from about 3 to 25 percent. All the soils have a low water-supplying capacity, so plants are damaged during dry spells.

The Armuchee soil and Stony hilly and rolling land,

limestone, are generally so shallow that they do not have enough depth for roots to develop normally. They have dense subsoils; therefore, they absorb water slowly, and runoff is rapid.

Cobbly alluvium, Staser and Sequatchie soil materials, is permeable to water, air, and roots. The porous texture of this land type and the high content of stones greatly reduce its capacity to hold water and plant nutrients.

Present use and management.—About 80 percent of this group is under forest. The forests on the Armuchee soil and on Stony hilly and rolling land, limestone, are mainly cedar; and on Cobbly alluvium, Staser and Sequatchie soils materials, they are chiefly mixed hardwoods. Most of the cleared areas are idle, but some are pastured because they are associated with soils suitable for that use. Some corn is grown on Cobbly alluvium, Staser and Sequatchie soil materials, but yields are low and weeds difficult to control. Lespedeza is grown to some extent on the Armuchee soil. The average yield is about 0.2 ton an acre, but under improved management, yields probably would rise to 0.4 ton. A few small patches of vegetables are grown, chiefly for home use. Fertilizers and lime have not been used on cleared areas.

Pastures are mainly unimproved. They consist of broomsedge and lespedeza mixed with weeds, brush, briers, and other native vegetation. On many areas of Stony hilly and rolling land, limestone, a sprinkling of bluegrass and whiteclover provides fair grazing early in the season.

Little marketable timber remains in the forests. The forests are not well managed. They have been cut over, burned over, and grazed too extensively. Cutting has not been selective, and little use is made of the cull trees and waste materials.

This land is used for pasture to some extent, but the carrying capacity is low. The number of days 1 acre is expected to graze an animal unit without injury to the pasture is given below under two levels of management; A, expected under prevailing management and B, expected under improved management:

	(A) Cow-acre-days	*(B) Cow-acre-days*
Armuchee silty clay loam, hilly phase	20	35
Cobbly alluvium, Staser and Sequatchie soil materials	35	75
Stony hilly and rolling land, limestone	35	60

Use suitability and management requirements.—Because this land is difficult to work and conserve, it is not suitable for crops. If properly managed it can be pastured. The Armuchee soil and Stony hilly and rolling land, limestone, appear to be well supplied with lime. Lime is needed to establish and maintain pastures on Cobbly alluvium, Staser and Sequatchie soil materials, but the texture is so porous that only light applications of lime and fertilizer should be added frequently, rather than heavy applications at longer intervals. All areas used for pasture need moderate to heavy applications of fertilizers high in phosphorus and potassium.

A suitable pasture mixture can be selected from orchardgrass, bluegrass, fescue, red clover, Ladino clover, white clover, and lespedeza. Grazing should be regulated and weeds eradicated. If pastures are properly fertilized and grazed, it is possible to control the weeds. Because the areas are so stony and sloping, mowing is difficult and is not an effective means of weed control.

MANAGEMENT GROUP 18

Management group 18 consists of the following steep, moderately deep to deep soils:

Clarksville cherty silt loam, steep phase.
Fullerton cherty silt loam, steep phase.
Fullerton cherty silt loam, eroded steep phase.

These soils all have some characteristic or combination of characteristics, such as stoniness, steep slopes, low fertility, or severe erosion, that make them unsuitable for crops or pasture. Some of the steepest uplands of the county, with slopes of 25 to as much as 60 percent, are in the group. The soils have chert and stone fragments on the surface and throughout the profile. They are low in organic matter and plant nutrients and are strongly acid. The soils are permeable to air, and in most of them roots can develop normally. The soils do not absorb and store rainfall well. Surface runoff is very rapid.

Present use and management.—Mixed hardwood forests cover about 80 percent of the acreage. The eroded steep phase of Fullerton cherty silt loam is cleared, but this soil is comparatively inextensive. Some cleared areas are idle, and others are included with associated soils used for pasture. None of the soil has been improved. Pastures consist of native vegetation, chiefly broomsedge mixed with weeds, brush, and briers. Woodlands are not well managed. Cutting is not selective, and little use is made of cull trees and waste materials.

Small amounts of lime and fertilizer, mainly superphosphate, have been applied to a few areas of Fullerton cherty silt loam, eroded steep phase. Amendments have not been used on the other soils of the group.

Crops are not commonly grown on these soils, and they are not suitable for cropping. Although Fullerton cherty silt loam, steep phase, ordinarily is not used for pasture, under good management it is expected that an acre would graze a cow for 60 days without injuring the pasture. Some of Fullerton cherty silt loam, eroded steep phase, has been used for pasture. On the average, an acre has provided 35 days of grazing for a cow without injury to the pasture. This soil probably would provide 60 days of grazing per acre under improved management.

Use suitability and management requirements.—The soils of this group should be used for forest. They are not suited to crops and pasture. If it is necessary to grow tilled crops, adequate liming and fertilizing are essential, and water control is needed. Crops must be selected and rotated carefully to encourage heavy vegetation. Stripcropping is advisable on most slopes.

To maintain pastures, lime and fertilizer, particularly phosphorus, must be added and other good management practiced. Legumes should make up a con-

siderable part of the pasture sod. It is difficult to apply materials and to control weeds in many places because of the steep slopes, stoniness, and inaccessibility of the soils.

MANAGEMENT GROUP 19

Group 19 consists of the following shallow, steep and very steep soils and miscellaneous land types:

Armuchee silty clay loam, steep phase.
Bouldery colluvium, Allen soil material.
Gullied land, limestone soil materials.
Muskingum stony fine sandy loam, steep phase.
Rockland, limestone.
Rockland, sandstone.

This group is made up of the steepest uplands in the county. The land is too steep, shallow, or stony for crops or pasture. Part of the acreage has almost vertical bluffs, such as those of the Cumberland escarpment. Less than 1 percent of the total acreage, mainly Gullied land, limestone soil materials, has been cleared, and the cleared areas are now generally reverting to forests.

Capability Groups of Soils

The capability grouping is an arrangement of soils to indicate their relative suitability for crops, grazing, forestry, or wildlife and the relative risks of erosion or other damage. Soils that are nearly level, well drained, free from overflow, fairly fertile, and not otherwise limited are placed in class I. They are widely adaptable. The farmer can use his class I soils for crops without special practices, and he can choose one of several cropping systems. If he wishes he may use the soils for pasture or for some other purpose.

Soils are placed in class II if they are a little less widely adaptable and are thus more limited than those in class I. A gently sloping soil, for example, must be farmed on the contour, kept under vegetation most of the time, or handled in some other manner that will control erosion. Other soils may be in class II because they are too droughty, too wet, or too shallow to be in class I.

Class III contains the soils that are suitable for regular cropping but that have narrower adaptations for use or more stringent management requirements than those in class II. The soils that are even more limited and that have narrower crop adaptations than those of class III, but that are still usable for tillage part of the time or with special precautions, are in class IV.

Soils not suitable for cultivation, or on which cultivation is not advisable, are in classes V, VI, VII, or VIII. Class V, not used in Marion County, consists of soils not subject to erosion but unsuitable for cultivation because of standing water or frequency of overflow. Class VI contains soils that are steep or droughty or that have other serious limitations but will produce fairly large amounts of forage or forest products. As a rule, class VI soils should not be cultivated, but some of them can safely be disturbed enough to prepare them for planting trees or for seeding to longtime pastures. Soils in class VII are more limited than those in class VI. They usually give only fair to poor yields of forage or wood products. Soils in class VIII, a class not used in Marion County, are so severely limited that they produce little useful vegetation. They may make attractive scenery or may be parts of useful watersheds. Some have value for wildlife.

Subclasses.—There are four main kinds of hazards that cause the soils of classes II through VIII to be limited in their capability. These are (1) surface runoff and risk of erosion; (2) excessive wetness; (3) droughtiness, stones, or other unfavorable features within the soil, and (4) climate. Droughtiness may result because the soil is shallow, is coarse textured, or has a very slowly permeable layer of rock or clay. Subclasses within the capability classes are defined according to the dominant one of these four hazards or limitations. Subclasses based on risk of erosion (e), wetness (w), and droughtiness or other unfavorable soil factors (s) occur in one or more of the capability classes in this county. A subclass based on climatic limitations (c) does not occur here.

Subclasses are designated by the class number and the appropriate letter, as IIe, IIs, and IIw.

Capability classes and subclasses in Marion County

The soils of Marion County are briefly described by capability classes and subclasses as follows:

Class I.—Soils that are easy to farm and have not more than slight limitations in use. They may be intensively cultivated without special measures to control excess water or erosion, and they may be expected to produce high yields with good soil and crop management. No subclasses of class I are used. Class I soils occupy 9,632 acres, or about 3 percent of the county.

Class II.—Soils that can be used for tilled crops with only slight risk of erosion or other limitations. Class II soils cover 34,432 acres, or 11 percent of the county.
- IIe: Undulating soils subject to erosion.
- IIs: Soils somewhat limited by stoniness, shallowness, or low water-supplying capacity.
- IIw: Imperfectly drained soils on bottom lands and colluvial slopes.

Class III.—Soils that can be used for tilled crops, but limited by moderate risk of erosion, excess water, or other adverse conditions. Class III soils occupy 83,537 acres, or about 26 percent of the county.
- IIIe: Rolling soils subject to erosion.
- IIIs: Soils limited by stoniness, shallowness, or low water-supplying capacity.
- IIIw: Imperfectly and poorly drained soils.

Class IV.—Soils that have severe limitations for cultivation and under that use require extreme care. Class IV soils occupy 10,706 acres, or about 3 percent of the county.
- IVe: Hilly and slowly permeable rolling soils subject to severe erosion.
- IVs: Rolling and hilly soils limited by droughtiness, or shallowness, or low fertility.
- IVw: Poorly drained soils with very slowly permeable subsoils.

Class VI.—Soils too steep, too eroded, too stony, or too shallow for cultivation, except occasionally to seed long-producing pasture or forage, or to plant trees. Class VI soils cover 50,378 acres, or about 15 percent of the county.

VIe: Hilly and steep soils.

VIs: Rolling, hilly, or stony soils of limited depth, fertility, or water-supplying capacity.

Class VII.—Soils too steep, too stony, too erodible, or too droughty for cultivation. Class VII soils occupy 135,795 acres, or about 42 percent of the county.

VIIe: Steep or erodible soils and gullied land.

VIIw: Cobbly, shaly soils with low moisture-supplying capacity, and stony steep land.

The capability class and subclass for each soil in Marion County is shown in the following list:

	Capability class and subclass
Allen fine sandy loam, eroded rolling phase (Ab)	IIIe.
Allen fine sandy loam, eroded hilly phase (Ac)	IVe.
Allen clay loam, severely eroded hilly phase (Aa)	VIe.
Allen stony fine sandy loam, eroded rolling phase (Ad)	IVs.
Allen stony fine sandy loam, hilly phase (Ae)	VIs.
Allen stony fine sandy loam, eroded hilly phase (Af)	VIs.
Armuchee silty clay loam, hilly phase (Ag)	IVs.
Armuchee silty clay loam, steep phase (Ah)	VIs.
Barbourville loam (Ba)	IIe.
Barbourville stony fine sandy loam (Bb)	IIIs.
Bolton silt loam, eroded rolling phase (Bc)	IIIe.
Bolton silt loam, hilly phase (Bd)	IVe.
Bolton silt loam, eroded hilly phase (Be)	IVe.
Bolton silty clay loam, severely eroded hilly phase (Bf)	IVe.
Bouldery colluvium, Allen soil material (Bg)	VIIs.
Bruno loamy fine sand (Bh)	IVs.
Capshaw silt loam, undulating phase (Ca)	IIe.
Capshaw silt loam, eroded undulating phase (Cb)	IIe.
Capshaw silt loam, eroded rolling phase (Cc)	IIIe.
Clarksville cherty silt loam, steep phase (Cf)	VIe.
Clarksville cherty silt loam, hilly phase (Ce)	IVe.
Clarksville cherty silt loam, rolling phase (Cd)	IIIe.
Cobbly alluvium, Staser and Sequatchie soil materials (Cg)	VIIs.
Colbert silty clay loam, eroded rolling phase (Ch)	IVs.
Cotaco and Atkins silt loams (Ck)	IIIw.
Crossville loam, rolling phase (Cl)	IIIe.
Cumberland silty clay loam, eroded undulating phase (Cm)	IIe.
Cumberland silty clay loam, eroded rolling phase (Cn)	IIIe.
Cumberland silty clay loam, eroded hilly phase (Co)	IVe.
Cumberland silty clay loam, severely eroded hilly phase (Cp)	IVe.
Emory silt loam (Ea)	I.
Etowah silty clay loam, eroded undulating phase (Eb)	IIe.
Etowah silty clay loam, eroded rolling phase (Ec)	IIIe.
Etowah silty clay loam, severely eroded rolling phase (Ed)	IIIe.
Etowah silty clay loam, eroded hilly phase (Ee)	IVe.
Etowah silty clay loam, severely eroded hilly phase (Ef)	IVe.
Fullerton silt loam, hilly phase (Fk)	IVe.
Fullerton silt loam, eroded hilly phase (Fl)	IVe.
Fullerton silt loam, eroded rolling phase (Fh)	IIIe.
Fullerton cherty silt loam, hilly phase (Fc)	IVe.
Fullerton cherty silt loam, eroded hilly phase (Fd)	IVe.
Fullerton cherty silty clay loam, severely eroded hilly phase (Fg)	VIe.
Fullerton cherty silt loam, steep phase (Fe)	VIe.
Fullerton cherty silt loam, eroded steep phase (Ff)	VIe.
Fullerton cherty silt loam, rolling phase (Fa)	IIIe.
Fullerton cherty silt loam, eroded rolling phase (Fb)	IIIe.
Greendale silt loam (Gb)	IIe.
Greendale cherty silt loam (Ga)	IIe.
Gullied land, limestone soil materials (Gc)	VIIe.
Hamblen loam (Ha)	IIw.
Hartsells fine sandy loam, undulating phase (Hb)	IIe.
Hartsells fine sandy loam, eroded undulating phase (Hc)	IIe.
Hartsells fine sandy loam, rolling phase (Hd)	IIIe.
Hartsells fine sandy loam, eroded rolling phase (He)	IIIe.
Hermitage silt loam, eroded undulating phase (Hf)	IIe.
Hermitage silt loam, eroded rolling phase (Hg)	IIIe.
Hollywood silty clay loam (Hh)	IIIw.
Huntington silt loam (Hm)	I.
Huntington loam (Hl)	I.
Huntington fine sandy loam (Hk)	I.
Jefferson fine sandy loam, rolling phase (Ja)	IIIe.
Jefferson fine sandy loam, eroded rolling phase (Jb)	IIIe.
Lindside silt loam (La)	IIw.
Linker loam, rolling phase (Lb)	IIIe.
Linker loam, eroded rolling phase (Lc)	IIIe.
Melvin silty clay loam (Ma)	IIIw.
Minvale cherty silt loam, eroded rolling phase (Mb)	IIIe.
Minvale silt loam, eroded undulating phase (Mc)	IIe.
Minvale silt loam, eroded rolling phase (Md)	IIIe.
Muskingum stony fine sandy loam, steep phase (Mg)	VIIs.
Muskingum stony fine sandy loam, hilly phase (Mf)	VIs.
Muskingum stony fine sandy loam, rolling phase (Me)	VIs.
Pace silt loam, eroded undulating phase (Pc)	IIe.
Pace cherty silt loam, eroded rolling phase (Pa)	IIIe.
Pace cherty silt loam, eroded hilly phase (Pb)	IVe.
Prader silt loam (Pd)	IIIw.
Robertsville silt loam (Ra)	IVw.
Rockland, limestone (Rb)	VIIs.
Rockland, sandstone (Rc)	VIIs.
Sequatchie loam, undulating phase (Sf)	IIe.
Sequatchie loam, eroded undulating phase (Sg)	IIe.
Sequatchie loam, eroded rolling phase (Sh)	IIIe.
Sequatchie fine sandy loam, undulating phase (Sd)	IIe.
Sequatchie fine sandy loam, eroded undulating phase (Se)	IIe.
Sequatchie cobbly fine sandy loam, undulating phase (Sa)	IIIs.
Sequatchie cobbly fine sandy loam, eroded undulating phase (Sb)	IIIs.
Sequatchie cobbly fine sandy loam, eroded rolling phase (Sc)	IIIs.
Staser loam (Sm)	I.
Staser fine sandy loam (Sl)	I.
Staser cobbly fine sandy loam (Sk)	IIs.
Stony hilly and rolling land, limestone (Sn)	VIs.
Swaim silty clay, severely eroded rolling phase (So)	IVe.
Swaim silty clay loam, eroded undulating phase (Sp)	IIe.
Taft silt loam (Ta)	IIIw.
Talbott and Colbert silty clay loams, eroded undulating phases (Td)	IIIs.
Talbott silty clay loam, eroded rolling phase (Tc)	IIIe.
Talbott silty clay, severely eroded rolling phase (Tb)	IVe.
Waynesboro loam, eroded undulating phase (Wg)	IIe.
Waynesboro loam, eroded rolling phase (Wh)	IIIe.
Waynesboro clay loam, severely eroded rolling phase (We)	IIIe.
Waynesboro loam, hilly phase (Wk)	IVe.
Waynesboro loam, eroded hilly phase (Wl)	IVe.
Waynesboro clay loam, severely eroded hilly phase (Wb)	VIe.
Waynesboro cobbly fine sandy loam, rolling phase (Wc)	IVs.
Waynesboro cobbly fine sandy loam, eroded rolling phase (Wd)	IVs.
Waynesboro cobbly fine sandy loam, hilly phase (We)	VIs.
Waynesboro cobbly fine sandy loam, eroded hilly phase (Wf)	VIs.
Whitwell loam (Wm)	IIw.
Wolftever silt loam, undulating phase (Wn)	IIe.

Soil Associations

Soils that occur together in a characteristic pattern make up a soil association. An association may consist of only a few or of many soils. The soils may be similar or may be of many different types. Although closely associated geographically, the soils in an association may differ in their suitability for agricultural use. For example, a soil suitable for corn may be adjacent to a soil so stony or steep as to be very

poorly suited to corn. To use the soil survey to the best advantage in general land planning and related uses, it is important to know not only the physical characteristics, distribution, and extent of the separate soils, their suitability for use, and their management requirements, but also to know in what soil association the soil occurs.

A brief discussion of each soil association follows. More detailed information about the component soils can be obtained from the discussion of the soils in the section, Soil Series, Types, and Phases.

A generalized map was made of the thirteen soil associations in the county. Their boundaries are shown in the colored soil-association map in the back of the report.

Cumberland-Etowah-Waynesboro

This association occupies an estimated 4.8 percent of the county. It consists mainly of soils of the Cumberland, Etowah, and Waynesboro series, which occur chiefly on high stream terraces. A large part of the association is comprised of Cumberland and Etowah soils, which are about equal in extent. Their relief is undulating to rolling, but there are occasional short, moderately steep slopes.

A significant acreage of other soils occurs within the association, although some of the included soils, mainly soils of the Allen, Swaim, and Hollywood series, are not commonly associated with the three principal soils. The combined acreage of the included soils is comparatively small.

Some soils of the first bottoms, low terraces, and colluvial lands are also included in the association in many places. These are Hamblen, Prader, and Staser soils on the bottom lands; Sequatchie and Whitwell soils on the low terraces; and Barbourville, Emory, and Hermitage soils on foot slopes and along intermittent drainageways.

The soils in this association are among the most fertile and productive in the county. They are well suited to all the commonly grown crops and respond well to good management. All the areas are in farms and are largely cropped or pastured. A small acreage is in forest that consists chiefly of upland hardwoods.

The farms in this association are generally larger than those in the other associations, and they are generally well maintained. Farming is highly diversified. Corn and small grains are sold to some extent, but livestock and livestock products and cotton and burley tobacco are the chief sources of income.

On most of the farms of moderate size, the soils are suitable for many different crops and for various types of farming. There is little need to use them to grow crops for which they are not suited. Management requirements are not exacting if crops are carefully chosen, but suitable rotations must be used, fertilizer applied, and methods used to control water.

Sequatchie-Staser-Hamblen

This association occupies an estimated 4.9 percent of the county. It occurs in nine rather small areas on low terraces and first bottoms. Most of the soils are in mountain coves or on broad smooth areas that extend outward from the coves. The largest area occupies the cove along Battle Creek.

The Sequatchie soils occupy an estimated 65 percent of the association. The other major soils are the Staser, which occurs near streams, and the Hamblen, on level or slightly depressed areas near the first bottoms. The Prader soil, a minor constituent, occurs in areas similar to those occupied by the Hamblen soil. Other inextensive soils and miscellaneous land types within the association are of the Allen, Barbourville, Bruno, Hollywood, Melvin, Pace, Swaim, Taft, Whitwell, and Wolftever series and Cobbly alluvium, Staser and Sequatchie soil materials.

Although there is an occasional short escarpment in places between the present flood plain and the low terraces the soils in this association are generally nearly level to undulating. The low terraces do not occupy typical terrace positions. Many occur in areas that appear to be more typical of those occupied by the colluvial soils. Only a small acreage of the soils on the low terraces is ever flooded. Most areas are 2 to 15 feet above the flood plain.

This association is important to the agriculture of the county because the soils are potentially highly productive. It is important also because of its position with respect to adjacent associations. The soils are well suited to intensive use for many crops. They are rather fertile and productive, but susceptibility to flooding, imperfect drainage, droughtiness, or stoniness restricts the use suitability of many of them. The Sequatchie soils are well suited to all of the common field crops of the county. The Staser and Hamblen soils are not well suited to alfalfa and small grains but are better suited to corn, hay, and pasture.

Considered as a whole, the soils of the association are moderately well supplied with plant nutrients and organic matter. Fair yields can be obtained without using amendments. The soils respond well to good management, especially if it includes use of lime and phosphorus.

Because the areas are rather narrow, some of the farms are only partly within the association. Most are general farms; only a few are part-time or subsistence farms. The farms are fairly small, and the association is rather densely populated. The farmsteads are well built and well maintained.

Practically all of this association has been cleared and is cropped intensively. The most commonly grown crops are corn or grain sorghum, small grains, crimson clover, and soybeans. These and livestock and livestock products are the chief sources of income. The management needs of the soils are not exacting, and the farmer has a wide choice of enterprises.

Fullerton-Clarksville-Greendale

The Fullerton-Clarksville-Greendale association occupies about 2.3 percent of the county. The Fullerton soils are the most extensive; the Clarksville are fairly extensive; and the Greendale, Minvale, and Pace, which together occupy a considerable acreage, are less

extensive. Other included soils are the Armuchee and Bolton and small areas of Emory, Hamblen, Hermitage, Lindside, Melvin, Prader, Staser, and Waynesboro soils.

The soils occur in six small, scattered areas in a part of the county called the "ridge section," which is dissected by ridges and valleys. The areas are generally hilly to steep and have a well-developed trellis drainage pattern. The ridges are winding, their tops narrow, and the slopes rather long and steep. The largest area, along the eastern rim of the valley in the southern part of the county, occupies Anderson Hill.

The Fullerton soils occur on uplands, and the Clarksville soils are chiefly on the steep slopes and higher ridges of the uplands. The Greendale, Minvale, and Pace soils are on most of the foot slopes and along narrow intermittent drainageways. The Armuchee soils occupy one long narrow strip, and the Bolton soils are on a few of the east-facing slopes.

Only a small part of the Clarksville soils, but about half of the Fullerton soils, has been cleared. The Greendale, Minvale, and Pace, the principal cleared soils in the valleys, with the minor colluvial or alluvial Emory, Hamblen, Hermitage, Lindside, Melvin, Prader, Staser, and Waynesboro soils, are the principal ones farmed. The farms are small to medium in size and are of either the general or subsistence type. Farming is diversified.

Cotton, corn, and lespedeza are the commonest crops, but vegetables, wheat, oats, clover, and alfalfa are grown to some extent. Poultry, dairy cattle, and hogs, grown mainly for use on the farm, are the principal kinds of livestock. A few farmers own small herds of beef cattle. Cotton and some livestock and livestock products provide the principal source of income on most farms. Forest products are a substantial source of income for many farmers.

Because the acreage suitable for cropping is rather small on individual farms, the farmer needs to get the best yields possible from crops on these soils. The use of the soils has generally been fairly well adapted to their capabilities, but better management would be necessary to obtain maximum yields. The soils of the uplands, largely in forest, are poor for crops but fair for pasture. The Greendale, Minvale, and Pace soils are suited to fairly intensive cropping.

Capshaw-Etowah-Taft

This association occupies about 1.3 percent of the county. It is in two areas, both near the eastern edge of the valley. The soils have developed mainly from alluvial materials washed chiefly from limestone.

The moderately well drained Capshaw soils, which are the most extensive, and the well-drained Etowah soils occupy most of the association. Inextensive areas of Colbert, Cumberland, Emory, Talbott, and Waynesboro soils are included, as well as small acreages of Robertsville, Melvin, Huntington and Lindside soils. The Capshaw soils occupy a position about halfway between the Etowah soils of the higher old terraces and the imperfectly drained Taft soil on the low terraces. The soils of the association have undulating to rolling relief, except for occasional short, moderately steep slopes.

Because a high proportion of the acreage is suitable for cropping, this association, though not extensive, is important to the agriculture of the county. The soils are potentially productive of both crops and pasture, so that they are well suited to livestock farming. The farms are generally small, and the farming is diversified. Corn, small grains, hay, and cotton are the principal crops, and beef cattle the most important kind of livestock.

Though the Capshaw soils are rather low in natural fertility, they are suited to nearly all the common crops except alfalfa. They respond well to good management, especially to applications of lime and complete fertilizer. Their response is not so great nor so lasting, however, as that of the associated Etowah soils, which are productive and suited to all the commonly grown crops. Slow internal drainage limits the use suitability of the Taft soil. This soil is suited mainly to such crops as soybeans, Kentucky fescue, and Ladino and alsike clovers. The soils in the association are generally used according to their capabilities, but improved management would increase yields.

Melvin-Wolftever-Huntington-Lindside

This association occupies only about 1.2 percent of the county. It includes some of the soils of the first bottoms and low terraces along the Tennessee River. The Melvin and Lindside soils occur in swales and sloughs; the Wolftever soil on fairly broad smooth areas between the swales or sloughs; and the Huntington soils on the natural levees and low first bottoms near the river.

About 85 percent of the association is comprised of Melvin and Wolftever soils. The Huntington and Lindside soils occupy lesser areas, and the included Sequatchie, Taft, and Whitwell soils occupy small areas.

Most of the soils have been cleared, but a fairly large acreage of the Melvin soil is still under forest. All of the soils are flooded periodically, which affects the choice of crops to be grown on them. Except for the poorly drained Melvin soil, most of the soils are well suited to the common crops, and some can be cropped intensively. The use suitability of the Wolftever soil is somewhat restricted, however, by rather slow internal drainage. Nevertheless, the drainage appears to be adequate for all the common crops except alfalfa.

Although the farms vary greatly in size, some of the largest in the county are in this association. Only a few farms are entirely within the association. Most of them extend into adjacent associations, which are chiefly on high terraces. General and combined general and livestock farms are the types most common, but on a few farms the products are grown mainly for home use.

Corn and lespedeza are the most common crops, but Ladino clover and Kentucky fescue are grown on a

small acreage of the Melvin soil. Small grains, chiefly oats, are grown to a small extent on the soils of the association. Corn is the most important cash crop, but a few farmers grow soybeans for sale. Cattle and hogs are the principal kinds of livestock and are an important source of income.

The soils of this association are generally used without much regard for their capabilities. On the Melvin soil especially, corn is often grown year after year, and total crop failures and low yields are common. The Huntington and Lindside soils are well suited to row crops and are intensively used to grow them. Corn is the main row crop grown. The Wolftever soil is used for practically all of the commonly grown crops, but yields are generally low, and a large acreage is idle each year.

Because the soils are generally suitable for hay and grain, and because many areas on nearby associations are suitable for pasture, this association is more suitable for livestock farms than any in the county. Improved management is needed, however, to make better use of the soil and water resources.

Staser-Hamblen-Prader

This association covers an estimated 2.8 percent of the county. It consists of soils of the first bottoms and low terraces that occur on a long narrow strip along the Sequatchie River. It is among the more important agricultural areas of the county because it contains a high proportion of soils suitable for intensive cropping and because it lies next to associations that consist of good agricultural soils.

The most extensive soils in the association are the Staser, and much less extensive are the Hamblen and Prader soils. Included in the association are members of the Capshaw, Cumberland, Emory, Etowah, Robertsville, Taft, Bruno, Sequatchie, and Whitwell series, but their combined acreage is small.

The soils are nearly level to undulating. They occupy natural levees near the river or other low ridges and intervening swales and sloughs that run nearly parallel to the river. Typically, the Staser soils are on the natural levees and on low first bottoms next to the river, and the Hamblen and Prader soils are in the swales and sloughs.

The soils of the association are fairly fertile, and the plant nutrients are replenished periodically by sediments deposited by floodwaters. Flooding, however, limits the use suitability of the soils. They are suitable mainly for summer annuals. The use suitability of the Hamblen and Prader soils is restricted by imperfect or poor drainage, but the well-drained soils and some that are not so well drained are well suited to intensive cropping.

Few of the farms are entirely within the association. Most of them extend into adjacent uplands or high terraces occupied by soils of other associations. The farms vary greatly in size. General farms or farms on which general and livestock farming are combined are the most common. The products are grown mainly for home use on only a few. Most of the soils have been cleared. The present woodlands consist mainly of narrow bands along the riverbanks and of small areas of Prader soil.

Corn and lespedeza are the crops grown most extensively. Corn is the most important cash crop, and soybeans are next in importance. A small acreage of Ladino clover and Kentucky fescue is grown on the Melvin soil. Small grains, chiefly oats, are minor crops, and a few farmers grow vetch or rye as a green-manure crop or as a cash crop. Crimson clover is grown on the better drained soils, but not so extensively as vetch. Livestock is an important source of income. Beef cattle and hogs are the principal animals raised.

The soils of the association have been used with fair regard for their capabilities, but it is difficult to use the poorly drained areas efficiently. The corn crop is often a total failure. Water-tolerant plants appear to be more desirable than corn for the wetter areas.

Waynesboro-Cumberland-Sequatchie

This association is in three small areas near the western rim of the valley. The areas are roughly rectangular and consist of soils of high terraces and associated alluvial or colluvial soils. The soils are predominantly rolling to hilly and have a moderately well developed drainage pattern.

The Waynesboro soils are the most extensive in the association. They and a large acreage of Cumberland soils occur on high terraces. The Sequatchie and Whitwell soils occupy low terraces, and some areas are subject to flooding. Barbourville and Emory soils occur along the intermittent drainageways. Bolton, Etowah, Fullerton, Hamblen, Hermitage, and Prader soils are included in the association, but because their acreage is small and the areas scattered, these soils have little effect upon the agriculture of the association.

As a whole, the soils of the association are productive and are suitable for cropping. Nearly all are deep, well drained, and well suited to the commonly grown crops. Severe erosion has made management more difficult on many areas, but the eroded areas are still well suited to hay and pasture.

The farms in the association are rather small and are operated mainly by part-time farmers. They are mainly general farms. On some, however, the products are grown principally for home use. Many areas are idle. Most of the association has been cleared, but a fairly large acreage has reverted to second-growth pine.

Corn and lespedeza are by far the most commonly grown crops. Small grains, chiefly oats, are grown to some extent. The vegetation on pastures is mainly lespedeza and volunteer plants, and the acreage of good permanent pasture is small. Livestock is generally not raised for sale, but a few farmers raise sizeable numbers for market.

Generally the soils in this association have been used without much regard for their capabilities. Yields are usually low, and much of the association is idle and actively eroding. Little of the association is

in improved pasture. Because of the large acreage of potentially very good pasture soils on the high terraces, however, the association could be used profitably for livestock raising.

Allen-Sequatchie-Barbourville

This predominantly hilly association occupies an estimated 1.4 percent of the county. The soils occur on a narrow band of foothills along the western rim of the valley. They consist mainly of deep colluvial deposits that were washed or rolled from soils of the Cumberland Plateau. This colluvial material has been deposited at the bases of the escarpments and has spread out a short distance over the valley floor. The areas are underlain by limestone. Most of the soils contain many stones. The stoniest areas are near the bases of the escarpments, and the content of stone decreases with distance from the foot of the slope.

The most extensive soils in the association are those of the Allen, Sequatchie, and Barbourville series, but some very inextensive areas of Hamblen and Prader soils are included. The Sequatchie soils occupy many of the rather broad, smooth tops of the escarpments, and some occur on the broad, smooth areas that extend outward from the bases of the escarpments. The Allen soils occupy the short, moderately steep slopes, and the Barbourville soils, most of the intermittent drainageways.

Chiefly because the soils are hilly, stony, or severely eroded, or because of a combination of these factors, only about half of the acreage in this association is suitable for row crops. The soils are well suited to pasture. The Sequatchie and Barbourville soils and the smoother stone-free areas of Allen soils are well suited to all the commonly grown crops. All are deep, well drained, easy to work, and productive if adequately fertilized.

The farms in the association are small, and the products are grown mainly for home use. The farms are largely worked by part-time farmers. The amount of cropland on each farm is limited. Much of the cleared land is idle, and many of the idle areas are severely eroded. On a few of the larger farms, a few head of livestock are raised, and some are sold. Corn and lespedeza, grown on practically all the farms, are the principal crops.

Management is exacting on the farms of this association, especially on the smaller farms. Yields high enough to be profitable are difficult to obtain without using the soils too intensively. The small size of the farms and the small acreage suitable for crops limit the choice of enterprises.

Sequatchie-Capshaw-Taft

This association, which occupies one rather small rectangular area near Powells Crossroads covers about 0.9 percent of the county. It consist of old alluvial soils, many of which are unrelated though they lie next to one another. The parent materials of one group, consisting chiefly of Sequatchie and Whitwell soils, were washed mainly from uplands underlain by sandstone. The soils of the other group, mainly the Capshaw, Taft, and Robertsville, have developed from limestone materials.

The most extensive soils in the association are the Sequatchie, which occupy an estimated 55 percent of the association. The rest of the association is about equally divided among the Capshaw, Taft, Robertsville, and Whitwell soils. The soils occur at elevations several feet above the present flood plain and are not subject to overflow. They have undulating to gently rolling relief. The area slopes gradually from its western limits to the steep talus slopes below the Cumberland Escarpment, which forms its eastern boundary. The underlying bedrock is limestone.

The use suitability of the soils in the association varies considerably, mainly because of drainage. The well-drained Sequatchie soils are well suited to all the common crops and can be used in a rather short rotation. The moderately well drained Capshaw soils, the imperfectly drained Taft, and the poorly drained Robertsville are all low in natural fertility, and yields are low under the usual management. The Capshaw, Taft, and Robertsville soils respond well to good management, however, and satisfactory yields can be obtained if better management is used. The use suitability of many areas of the Whitwell soil is limited by imperfect drainage, but drainage is adequate for most of the commonly grown crops except alfalfa.

Practically all of this association has been cropped for many years. The farms are about 50 acres in size. On most of them general and livestock farming are combined. Corn, lespedeza, and soybeans are the principal crops, and there is little well-managed permanent pasture. Livestock consists mainly of small herds of beef cattle and a few small dairy herds.

To a fair extent, the well-drained soils of the association are used according to their capabilities, but the poorly drained soils are not always used for purposes to which they are suited. Poor drainage and the low natural fertility of some of the soils are the principal management problems.

Fullerton-Waynesboro-Greendale

The two areas of the Fullerton-Waynesboro-Greendale association occupy about 1.1 percent of the county. In general the soils consist of rather thin alluvial deposits over limestone materials, which in many places are exposed at the surface. The relief is predominantly hilly, but it ranges from rolling to steep. Short, moderately steep slopes with rather broad rolling tops are common. The areas are highly dissected by a moderately well developed dendritic pattern of drainageways.

The Fullerton soils, which are the most extensive in the association, occupy most of the steeper slopes and narrow crests. The Waynesboro soils occur on the broader rolling ridgetops and on the alluvial slopes. The Greendale soils occupy areas along the intermittent drainageways, and Minvale and Pace soils are on most of the colluvial foot slopes.

Chert in many areas of the Fullerton soils and cobblestones in much of the acreage of Waynesboro soils interfere greatly with tillage. Because of the strong slopes and high content of chert and cobblestones, only a little more than half of the association is suited to crops. The Fullerton soils are very low in natural fertility but respond well to amendments. The Waynesboro soils are productive if adequately fertilized. Crops and rotations must be chosen carefully, however, because of the steepness of slope.

Most of the farms in this association are small. They are mainly general farms, and the products are used on the farm. Cotton is the principal cash crop but it is not grown extensively. The corn and small grains and the livestock and livestock products are used mainly on the farm. Fewer head of livestock are raised and pastures are less extensive than on most of the associations in the county. A large acreage is in unimproved pasture or is idle. A fairly large acreage is in cutover forest.

The use of the soils conforms fairly well to their capabilities, but improved management is needed. Management and the choice of enterprise are difficult because of the lack of sufficient cropland on most of the farms. Most farms would best be used to raise livestock.

Hartsells-Muskingum-Cotaco-Atkins

This association, which is on the Cumberland Plateau, occupies about 34.2 percent of the county. The areas are mainly rolling to hilly, but some are undulating. They are dissected by a dendritic pattern of drainageways. Along the drainageways and near their heads are narrow bands of colluvial and alluvial soils.

The Hartsells soils occupy areas of undulating to rolling relief; the Linker, areas of rolling relief. The Muskingum are on hilly and steep areas nearer the rim of the escarpment. Soils of the Cotaco and Atkins complex, and a small acreage of Barbourville soils, occur near the drainageways.

The soils are predominantly fine sandy loams underlain by sandstone. There are many sandstone outcrops in most places on the shallow Muskingum soils, which occupy the more deeply dissected areas.

The association is sparsely populated. On the widely scattered farms, the products are grown mainly for home use. Most of the farms are without telephone service or electricity. Roads are few and are generally poor. Except for a few gravelled and two hard-surfaced roads, most travel is over logging trails, many of which can be traveled only by wagon.

Two types of forest—blackjack oak-hardwoods and upland hardwoods—cover most of the association. The species include pignut hickory, white hickory, blackgum, black oak, blackjack oak, chestnut (dead trees), white oak, chestnut oak, red maple, scarlet oak, and sourwood. Chestnut oak, black oak, and scarlet oak grow on exposed areas on the summits of the sharper ridges. Scarlet oak, white oak, pignut hickory, blackgum, sassafras, and dogwood are on the slopes of the ridges, and a few tulip-poplars are at the bases of the slopes. White oaks and some scarlet oaks, black oaks, and occasional post oaks are on the broad level tops of some of the ridges and wide benches and on the well-drained alluvial soils. Red maple, blackgum, and sweetgum grow on the imperfectly drained Cotaco and Atkins soils.

The Hartsells and Linker soils are moderately well suited to a number of crops, including vegetables, but corn is the principal crop. The other soils are generally not cultivated. The Muskingum soils, because of steep slopes or stoniness, and the Cotaco and Atkins, because of slow drainage, are seldom cultivated, but they are fairly well suited to pasture.

This association contains a large acreage suitable for agricultural development. The present ownership pattern, the lack of good roads and markets, the low natural fertility of the soils, and the cost of clearing have all hindered development, but in nearby counties agriculture is highly developed on similar associations.

Muskingum-Hartsells-Jefferson

This association, which occupies an estimated 12 percent of the county, occurs on Walden Ridge. The soils are underlain by sandstone and are predominantly fine sandy loams. Though similar to the Hartsells-Muskingum-Cotaco-Atkins association, the Muskingum-Hartsells-Jefferson association includes Hartsells soils that are generally shallower, and the soils have steeper relief. Relief ranges from undulating to steep but is predominantly hilly and steep.

The most extensive soils in the association are the Muskingum, which occupy the hilly and steep slopes. The Hartsells soils are on the undulating and rolling tops of the slopes, and the Jefferson soils are on the colluvial benches or foot slopes. There is little colluvial soil along the V-shaped drainageways.

The area is rather sparsely populated. The few farms are widely scattered and are operated by part-time farmers. The products are grown mainly for home use. The principal source of income for most of the farmers is coal mining or work in the lumber mills.

Most of the farms of this association are without telephone service, electricity, or other modern facilities. Roads are few and are generally poor. Except for one hard-surfaced road and a few gravelled roads, most travel is over logging trails, many of which can be traveled only by wagon.

This association does not have the potential for agricultural development of the Hartsells-Muskingum-Cotaco-Atkins association. The areas of Hartsells soils that are suitable for cropping are generally somewhat isolated by large areas of Muskingum soils, which because they are shallow, stony, and have hilly or steep relief, are unsuited to crops and are poor for pasture. Little of the association has been cleared, and most of the cleared areas are along the highway that connects the valley of the Sequatchie River with Chattanooga.

Rockland, limestone-Bouldery colluvium-Rockland, sandstone

This association, which is on the Cumberland escarpment, occupies about 33 percent of the county. The areas are predominantly steep or very steep and consist mainly of stony land and rockland. The drainage is very rapid, and streams have dissected the land intensively.

Very steep areas of Rockland, sandstone, which have slopes of more than 60 percent, form the upper part of the escarpments. Below this is a belt of Bouldery colluvium, Allen soil material, which occupies talus slopes of about 40 percent. The lower slopes, below Bouldery colluvium, Allen soil material, consist chiefly of steep Rockland, limestone, although some hilly areas are included, as well as Stony hilly and rolling land, limestone, and some steep land. Also included in the association are areas of Cobbly alluvium, Staser and Sequatchie soil materials, which occur at the heads of many of the coves.

Practically all of the association is in forest. Less than 3 percent has been cleared.

Upland hardwoods cover practically all of the association. Cow oak, swamp white oak, and papaw or hemlock grow along streams in the coves. Yellow buckeye, scarlet oak, blackgum, black oak, pignut hickory, white oak, black walnut, sugar maple, and yellow locust are on the lower slopes. Redcedar is conspicuous wherever limestone outcrops. The quality of the trees on south-facing slopes is inferior to that on northern exposures, and the stands are thinner. The north-facing slopes support a dense growth of most of the species commonly growing on lower slopes. Pignut hickory, scalybark hickory, and white oak are conspicuous. Black walnut, black cherry, white elm, white ash, basswood, cucumbertree, umbrella-tree, northern red oak, and yellow-poplar are almost entirely on the north-facing slopes.

The population on farms in this association is small. On the farms the products are grown mainly for home use. Forest products are a source of income for many of the farmers. The association has low potential for agricultural development, and forestry appears to be its best use.

Morphology and Genesis of Soils

Soil is produced by weathering and other factors of soil development acting on the parent materials deposited or accumulated by geologic agencies. The characteristics of a soil depend on (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and has existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the forces of soil development have acted on the soil material (*5*). The effects of climate on soil and plants depend not only on temperature, rainfall, and humidity, but also on the physical characteristics of the soil material and on the relief. Relief, in turn, strongly influences drainage, aeration, runoff, erosion, and exposure to sun and wind.

The five soil-forming factors are interdependent; each modifies the effects of the others. Climate and vegetation are the active factors that change the parent material and from it gradually form a soil. Relief largely controls runoff and therefore influences the effectiveness of climate and vegetation. The nature of the parent material affects the kind of profile that can be formed and in extreme cases dominates it entirely. Finally, time is needed for changing the parent material into a soil profile. The time needed for horizon differentiation may be much or little. Usually a long interval of time is needed for the development of distinct horizons.

In the first part of this section, the five factors of soil formation are discussed as they are related to the soils of Marion County. In the second part there is a discussion of the morphological characteristics of the soils, but because physical and chemical data are limited, the discussion of genesis and morphology is incomplete. Table 23 gives some of the factors that have contributed to the morphological differences of the soils.

Factors of Soil Formation in Marion County

Parent materials

The parent materials of the soils of Marion County are of two kinds: (1) Residuum from the weathering of rocks in place, and (2) materials transported by water or gravity and laid down as unconsolidated deposits of clay, silt, sand, and large rock fragments. The residual materials are similar to the underlying rocks from which they were derived; the materials transported by water or gravity are similar to the soils or rocks from which they were carried.

The parent materials of soils formed in place consist of the residuum from many kinds of sedimentary rocks, including dolomites, limestones, sandstones, and shales. These rocks range in age from the Basal Pennsylvanian to the Upper Ordovician Systems (*6, 7*). The properties of the rocks are strongly reflected in many of the properties of the soils that have developed from them.

The characteristics of soils developed in place, that is, from sedentary material, are closely related to those of the parent rock. This is true also of the alluvial soils, but inasmuch as the alluvial soils consist largely of mixed materials from different parent rocks, the relationship is less obvious. Although a rather consistent relationship exists between the kind of parent material and some of the soil properties, some soil characteristics must be attributed to other factors.

Climate

Marion County has a humid temperate climate. The high rainfall causes rather intense leaching of soluble and colloidal materials downward through the

TABLE 23.—*Soil series of Marion County, Tenn., classified by higher categories, and factors that have contributed to differences in their morphology*[1]

Great soil groups and series [2]	Relief	Parent material	Time [3]
ZONAL SOILS			
Reddish-brown Lateritic soils			
Bolton	Rolling to steep	Residuum from high-grade limestone	Long.
Cumberland	Undulating to hilly	Old alluvium chiefly from limestone	Long.
Hermitage	Undulating to rolling	Old colluvium from argillaceous and high-grade limestones	Long.
Red-Yellow Podzolic soils			
Allen	Rolling to steep	Old colluvium chiefly from acid sandstone	Long.
Capshaw	Undulating to rolling	Old alluvium chiefly from limestone	Long to very long
Clarksville [4]	Rolling to steep	Residuum from cherty limestone	Medium.
Crossville	Undulating to rolling	Residuum from acid sandstone	Long.
Etowah	Rolling to steep	Old alluvium chiefly from limestone	Long.
Fullerton	Rolling to steep	Residuum from cherty limestone	Long.
Hartsells	Undulating to rolling	Residuum from acid sandstone	Long.
Jefferson	Rolling	Old colluvium from acid sandstone	Medium to long.
Linker	Undulating to rolling	Residuum from acid sandstone	Long.
Minvale	Undulating to rolling	Old colluvium from cherty limestone	Medium to long.
Pace	Undulating to hilly	Old colluvium from cherty limestone	Long to very long.
Sequatchie	Undulating to rolling	Old alluvium chiefly from sandstone but generally contains some materials from limestone.	Medium to long.
Swaim	Undulating to rolling	Old colluvium from argillaceous limestone	Short to medium.
Talbott	Undulating to hilly	Residuum from argillaceous limestone	Long.
Waynesboro	Rolling to steep	Old alluvium from sandstone, shale, and limestone	Long.
Whitwell [5]	Undulating	Old alluvium chiefly from sandstone but generally contains some materials from limestone.	Medium to long.
Wolftever	Undulating	Old alluvium chiefly from limestone	Medium to long.
INTRAZONAL SOILS			
Planosols			
Robertsville	Nearly level	Old alluvium chiefly from limestone	Very long.
Taft	Nearly level	Old alluvium chiefly from limestone	Very long.
AZONAL SOILS			
Lithosols			
Armuchee	Hilly to steep	Residuum from interbedded limestone and shale	Short to medium.
Colbert	Undulating to rolling	Residuum from argillaceous limestone	Short to medium.
Muskingum	Rolling to steep	Residuum from acid sandstone	Short to medium.
Alluvial soils			
Atkins[5]	Nearly level	Alluvium or colluvium from acid sandstone	Short to medium.
Barbourville	Undulating	Alluvium or colluvium from acid sandstone	Short to medium.
Bruno	Nearly level	Alluvium chiefly from sandstone, shale, and limestone	Very short.
Cotaco	Nearly level	Alluvium or colluvium from acid sandstone	Short to medium.
Emory	Nearly level to undulating	Alluvium or colluvium from high-grade limestone	Short to medium.
Greendale	Undulating	Alluvium or colluvium from cherty limestone	Short to medium.
Hamblen	Nearly level	Alluvium from mixed sandstone, shale, and limestone	Very short.
Hollywood	Undulating	Alluvium or colluvium from argillaceous limestone	Short.
Huntington	Nearly level	Alluvium chiefly from limestone, some sandstone	Very short.
Lindside	Nearly level	Alluvium chiefly from limestone, some sandstone	Very short.
Melvin[5]	Nearly level	Alluvium chiefly from limestone, some sandstone	Very short.
Prader[5]	Nearly level	Alluvium from mixed sandstone, shale, and limestone	Very short.
Staser	Nearly level	Alluvium from mixed sandstone, shale, and limestone	Very short.

[1] Climate and vegetation are nearly uniform, so they do not account for broad differences among the soils.

[2] This table does not include miscellaneous land types because they are not classified by soil series.

[3] Refers to the length of time that the material has been in place, as indicated by the degree of profile development.

[4] The steeper parts are more nearly Lithosolic.

[5] An intergrade to Low-Humic Gley (Gray Hydromorphic) soils.

soil. The soil is frozen for only short periods, especially in the valleys. It freezes to only shallow depths, and as a result weathering and movement of materials are active most of the year. The slightly lower temperatures at some of the higher elevations on the plateau slow the chemical reactions in the soils. The plateau soils are frozen for slightly longer periods and to greater depths than the soils in the valleys, and leaching is thus retarded.

Within any climatic zone, climate is responsible for many of the outstanding characteristics that the well-developed, well-drained soils have in common. The differences in climate within this county are not great enough, however, to account for the broad differences that exist among the soils. Differences in such factors as parent material, drainage, and age appear to have been of primary importance in determining the great soil group to which the soils belong.

Plant and animal life

Trees, shrubs, grasses, and other herbaceous plants, and micro-organisms, earthworms, and various other forms of plant and animal life live on and in the soil and are active in the soil-forming processes. The nature of the changes that they bring about depends, among other things, on the kind of plant or animal life and the life processes peculiar to each.

The kinds of plants and animals that live on and in the soil are determined by environmental factors, including climate, parent material, relief, age of the soil, and the associated organisms. The influence of climate is most apparent, though not always most important, as a determinant of the kinds of macroflora that grow on the well-drained, well-developed soils. Climate, by influencing plant growth, exerts a powerful indirect influence on the morphology of soils. Climate and vegetation acting together are the active factors of soil genesis.

A hardwood-pine forest once covered most of the county. On the plateau there was a higher proportion of pines, and in much of the valley there probably were almost pure stands of hardwoods. There were probably differences in the density of stands, the relative proportion of species, and the associated ground cover. Nevertheless, taking the area as a whole, the forests appear to have been fairly uniform except for those at high elevations on the plateau. It is doubtful if any of the marked differences in properties among the well-drained, well-developed soils are the direct result of differences in vegetative cover alone.

The roots of the trees that grow in this area go moderately deep to deep to feed on plant nutrients in the soil. The trees are mainly deciduous. They take essential plant nutrients from the lower part of the soil, store them in the leaves, and return them to the upper part of the soil when the leaves fall to the ground. The leaves of the different species vary considerably in content of plant nutrients. In general the amount of bases and phosphorus returned to the upper part of the soil in leaves of deciduous trees is somewhat greater than that returned when pine needles and pine cones are shed.

Much organic material is added to the soil in the form of dead leaves, roots, and entire plants. The organic material that accumulates in the soil retards the depleting action of percolating water. Most of it is added to the A horizon, where it is acted upon by micro-organisms, earthworms, and other forms of life and by chemicals. In Marion County the organic materials decompose rather rapidly because of the favorable temperature and moisture conditions, the favorable character of the organic material itself, and the presumably favorable micropopulation of the soil.

Relief

The soils of Marion County range in relief from almost level to very steep. Relief modifies the effects of climate and vegetation. On some steep areas, much water runs off. Consequently geologic erosion keeps an almost even pace with rock weathering and soil formation. In such steep areas, soil materials are constantly removed or mixed by creeping, or rolling, or by minute to moderate slides; they do not remain in place long enough for a profile of genetically related horizons to form. A small quantity of water percolates through the soil on steep slopes, but little leaching or translocation of materials takes place. The vegetation is generally not so dense on the steep slopes as on milder slopes that have deeper soils and more favorable moisture conditions.

On some of the nearly level areas, surface runoff is very slow and internal drainage is slow. These poorly drained areas commonly have a subsoil that is mottled yellow and gray. Geologic erosion is very slow on these nearly level areas, and the soils so located may develop a highly leached surface layer and a compacted, gleyed subsoil.

Time

Some materials have been in place for such a short time that the influences of climate and vegetation have not had the opportunity to act in developing well-defined and genetically related soil horizons. Most soils of the first bottoms are composed of such materials, as are also the steeply sloping soils. The soils on first bottoms receive new alluvial deposits; the soils on steep slopes have their materials removed by geologic erosion.

The soils of bottom lands and the soils on steep slopes are the young soils of the county. The soils that have been in place for a long time and have approached an equilibrium with their environment are considered to be mature. In Marion County the soils range from very old to very young.

Classification of Soils

Soils may be classified several ways to bring out their relation to one another. The simple classification units commonly used in the field are the series, type, and phase. These units are discussed in the

section, Soil Survey Methods and Definitions. Soil series may be grouped into higher categories consisting of soil orders and great soil groups. The three soil orders—zonal, intrazonal, and azonal—are represented in Marion County.

Soils of each of the three broad orders—zonal, azonal, and intrazonal, may be derived from similar kinds of parent materials. Within any one of those orders in the county, major differences among the soils appear to be closely related to differences in the kinds of parent materials from which the soils were derived. The thickness of the soils that developed from residual materials over the rock from which they were derived is a partial result of the resistance of the rock to weathering, the volume of residue after weathering, and the rate of geologic erosion. The chemical and physical nature of the parent material modifies the rate and direction of the chemical changes that result from climate and vegetation. The kind of parent material also exerts a pronounced influence on the kinds of vegetation that grow on the soil.

Table 23 shows the classification of the soils of Marion County. The soils are listed according to order. The great soil groups under each order are shown, and the various soil series are listed under each soil group. The sources and kinds of parent materials and the relief and age of each soil are also given.

Zonal soils

Zonal soils are soils having well-developed characteristics that reflect the influence of the active forces of soil genesis—climate and living organisms, chiefly vegetation (*5*). Many of the zonal soils of Marion County, because they have developed under similar climate and vegetation and have been little influenced by relief or age, have similar properties, though they have developed from different kinds of parent material.

All of the zonal soils in the county, before they are cultivated, are similar in that they have on their surface a layer of organic debris in varying stages of decomposition. All have a dark-colored A_1 horizon. The A_2 horizon is lighter in color than either the A_1 or the B. The B horizon is generally uniformly colored yellow, brown, or red and is heavier textured than the A_1 or A_2 horizons. The C horizon varies in color and in texture in different soils, but in most places it is light red or yellow, mottled with gray or brown. All of these soils are well drained and have well-developed profiles. They are Reddish-Brown Lateritic soils or Red-Yellow Podzolic soils.

REDDISH-BROWN LATERITIC SOILS

The Reddish-Brown Lateritic soils are reddish-brown, friable, granular, clayey soils over deep-red friable and granular clay. They have a network of mottles in places in the deep substrata. The development of these soils was lateritic, with little or no podzolization, in a tropical wet-dry climate with moderately high rainfall. The soils have good external and internal drainage. Their productivity is naturally low to medium, but if fertilized and irrigated, their productivity is medium to high. They now support small farm units on which the products are grown for home use (*5*). The Reddish-Brown Lateritic soils in this county are represented by soils of the Bolton, Cumberland, and Hermitage series.

Bolton Series.—The Bolton soils have developed from sandy dolomitic limestone or from limestone containing thin lenses of sandstone. They occupy small scattered areas throughout the cherty ridge belt in association with the Fullerton and Clarksville soils. They are normally on the steep east-facing or southeast slopes of some of the higher ridges. The soils, though similar to the Fullerton soils in some characteristics, are darker colored throughout, relatively free of chert, and have a more friable B horizon. These soils are well drained, medium acid, and have a rather high content of organic matter.

Typical profile of Bolton silt loam:

- A_1 0 to 2 inches, very dark grayish-brown (10YR 3/2) friable silt loam.
- A_2 2 to 8 inches, dark-brown (10YR 3/3 to 7.5YR 3/2) very friable silt loam; moderate medium granular structure.
- A_3 8 to 12 inches, reddish-brown (5YR 4/4) friable light silty clay loam; weak medium blocky structure.
- B_1 12 to 22 inches, red to dark-red (2.5YR 4/6 to 3/6) friable silty clay loam; moderate medium blocky structure.
- B_2 22 to 44 inches, red to dark-red (2.5YR 4/6 to 3/6) friable silty clay; moderate medium blocky structure; numerous black specks and stains, as well as a few black concretions that probably consist of iron and manganese oxides.
- C 44 inches +, red (2.5YR 4/6) friable silty clay or silty clay loam, streaked or variegated with yellowish brown; bedrock is at depths of 10 to 20 feet or more.

Cumberland Series.—The Cumberland soils have developed on high-lying, very old deposits of mixed alluvium in which limestone material appears to be the major component. The predominant slope of these soils is undulating to rolling, but some areas are hilly. Their comparatively high fertility apparently favored growth of a high-quality, dense forest, which left a high content of organic matter in the upper layers. This forest growth also favored a high return of bases to the surface from the leaves of the deciduous trees.

The Cumberland soils are associated with the Etowah and Waynesboro soils. They are older and have more strongly developed horizons than the Etowah soils and have less siliceous materials and less podzolization than the Waynesboro soils. The Cumberland soils are well drained and medium acid.

Typical profile of Cumberland silty clay loam:

- A_p 0 to 8 inches, dark-brown (7.5YR 3/2) to dark reddish-brown (5YR 3/3) friable light silty clay loam, in some places more nearly a clay loam.
- B_1 8 to 21 inches, dark reddish-brown (5YR 3/4) friable silty clay; moderate medium blocky structure.
- B_2 21 to 44 inches, red, to dark-red (2.5YR 4/6 to 3/6) firm silty clay, sandy clay, or clay; moderate medium blocky structure.
- B_3 44 to 60 inches, red (2.5YR 4/6) firm to friable sandy clay; moderate medium blocky structure.

Hermitage Series.—The Hermitage soils have developed on old colluvium or on old local alluvium derived from high-grade limestone materials. The materials have washed or rolled from higher lying red

soils, such as the Bolton, Cumberland, and Waynesboro, and to a lesser extent, from the Fullerton soils. The Hermitage soils have formed under a deciduous forest that consisted chiefly of poplar, oak, and hickory. The dense forest cover has caused the upper part of the soils to have a rather high content of organic matter and has retarded the removal of bases from the profile. In age the soils of the Hermitage series are about intermediate between the Emory soil, which lies along the drainageways below them, and the Cumberland and Waynesboro soils, which commonly occupy the higher lying areas above them.

The Hermitage soils are well drained, fertile, and about medium acid.

Typical profile of Hermitage silt loam:

0 to 8 inches, dark-brown (10YR 4/3 to 3/3) very friable silt loam; weak medium granular structure; wooded areas have a thin surface layer stained dark with organic matter.
8 to 20 inches, reddish-brown (5YR 4/4) friable silty clay loam; weak fine blocky structure.
20 to 40 inches, yellowish-red (5YR 4/6) to reddish-brown (5YR 4/4) friable silty clay loam; moderately developed fine blocky structure.
40 to 56 inches, yellowish-red (5YR 4/8) friable silty clay loam with a few fine distinct yellowish-brown variegations; weak medium subangular blocky structure; numerous black specks and stains.

RED-YELLOW PODZOLIC SOILS

The Red-Yellow Podzolic soils are a group of well-developed, well-drained acid soils. They have a thin organic (A_0) and an organic-mineral (A_1) horizon over a light-colored bleached (A_2) horizon. These horizons overlie a red, yellowish-red, or yellow and more clayey (B) horizon. The parent materials are all more or less siliceous. Coarse reticular streaks or mottles of red, yellow, brown, and light gray are characteristic of deep horizons of Red-Yellow Podzolic soils where parent materials are thick (*4*).

Representative soil series to which the Red-Yellow Podzolic soils of Marion County belong are discussed in the following pages. These are the Allen, Capshaw, Clarksville, Crossville, Etowah, Fullerton, Hartsells, Jefferson, Linker, Minvale, Pace, Sequatchie, Swaim, Talbott, Waynesboro, Whitwell, and Wolftever.

Allen and Jefferson Series.—The soils of the Allen and Jefferson series were derived from old colluvium, chiefly from acid sandstone. The materials from which the Allen soils were formed were washed chiefly from uplands that occupy the tableland above the Cumberland escarpment, and these areas are underlain by sandstone. The colluvial materials were deposited at the base of the steep escarpment. The Jefferson soils have developed in materials similar to those in which the Allen soils have developed, but they usually occupy colluvial slopes and benches along the bases of Muskingum ridges on the Cumberland Plateau. The Allen soils are clay loam, fine sandy loams, or stony fine sandy loams; the Jefferson are fine sandy loams.

The soils of both series are well drained. The Allen soils are medium to strongly acid. The Jefferson are strongly acid.

Capshaw and Wolftever Series.—The soils of the Capshaw and Wolftever series were derived mainly from old alluvium, chiefly from limestone. The Capshaw soils occupy old stream terraces about intermediate in position between the low and high terraces. The Wolftever soil occurs on low stream terraces. The Capshaw soils are undulating to rolling, and the Wolftever is undulating.

The soils are moderately well drained. They are medium to strongly acid. The Capshaw soils are low in plant nutrients, but the Wolftever soil has a moderately good supply.

Clarksville Series.—The Clarksville soils are associated with the Fullerton soils, which they resemble to some extent. They are lighter colored than the Fullerton soils and have developed from a more siliceous or cherty bedrock. Like the Fullerton soils, they occupy rather high prominent ridges that extend through the center of the valley along the Sequatchie River. They are highly leached throughout and are strongly acid.

Typical profile of Clarksville cherty silt loam:

A_1 0 to 1½ inches, grayish-brown (10YR 5/2) very friable cherty silt loam.
A_2 1½ to 8 inches, light brownish-gray to pale-brown (10YR 6/2 to 6/3) friable cherty silt loam.
B_2 8 to 20 inches, light yellowish-brown to brownish-yellow (10YR 6/4 to 6/6) friable cherty silty clay loam or heavy silt loam.
C 20 to 48 inches +, very cherty silt loam or cherty silty clay loam, splotched or streaked with brown, gray, and red; cherty limestone strata underlie this layer at depths of 4 feet or more.

Crossville Series.—The Crossville soils, represented in Marion County by Crossville loam, rolling phase, are browner and slightly thinner over bedrock than the Hartsells soils. The soils of both series appear to have developed from level-bedded acid sandstone, but in places the bedrock grades to fine-grained conglomerate. The Crossville soils have developed under vegetation and climate similar to the vegetation and climate under which the Hartsells and Linker soils developed. Their drainage is slightly less rapid. The Crossville soils are moderately deep to bedrock, have a weak horizon development, and are strongly acid.

Typical profile of Crossville loam:

A_1 0 to 1 inch, very dark gray to dark gray (10YR 3/1 to 4/1) very friable loam.
A_2 1 to 7 inches, dark-brown (10YR 4/3 to 3/3) very friable loam; weak medium crumb structure.
B_1 7 to 13 inches, dark-brown (10YR 4/3) very friable light clay loam; weak fine blocky structure.
B_2 13 to 20 inches, yellowish-brown (10YR 5/4) friable clay loam or silty clay loam; weak fine blocky structure.
B_3 20 to 24 inches, yellowish-brown (10YR 5/4) friable clay loam; faintly splotched with strong brown; weak fine blocky structure; contains many small pebbles that apparently weathered from the fine-grained conglomerate bedrock; bedrock is at a depth of 24 inches.

Etowah Series.—The soils of the Etowah series have developed from materials similar to those from which the Cumberland soils have developed, but they are somewhat younger in profile development. They generally occur at lower elevations and have smoother relief. Their B horizon, in most places, is more friable, lighter red, and contains less clay than that of the Cumberland soils.

The Etowah soils have supported a dense stand of poplar, and hickory. This high-quality natural forest

cover and the fine-textured parent material probably account for the difference between these soils and the more strongly leached and light-colored soils such as those of the Jefferson series. The Etowah soils are well drained and about medium acid.

Typical profile:

- A_p 0 to 8 inches, brown to dark-brown (10YR 5/3 to 4/3) very friable coarse silty clay loam; under virgin conditions the top 1 to 2 inches is very dark grayish brown.
- A_3 8 to 11 inches, brown to dark yellowish-brown (10YR 4/3 to 4/4) friable light silty clay loam; weak fine blocky structure.
- B_2 11 to 32 inches, yellowish-red (5YR 5/6 to 4/6) friable silty clay loam; moderate medium blocky structure; the color appears lighter when the aggregates are crushed.
- 32 to 44 inches +, red (2.5YR 4/6) to yellowish-red (5YR 4/6) moderately friable silty clay loam; weak medium to coarse blocky structure; below 44 inches, material is irregularly streaked with yellowish brown, and pebbles and cobblestones are common; limestone bedrock at depths of 4 to 15 feet.

Fullerton Series.—The Fullerton soils have developed from residuum derived chiefly from dolomitic limestone high in insoluble materials, chiefly silica. The silica is largely in the form of chert, but in places lenses of calcareous sandstone have contributed to the parent materials. These soils commonly occupy rather high linear ridges that extend through the center of the valley.

The Fullerton soils are only slightly susceptible to erosion. They therefore have a thick mantle of soil material over the bedrock. The cherty dolomite underlying the soils weathers more slowly than high-grade limestone or dolomitic limestone, and the thick mantle of soil materials protects the bedrock from rapid weathering. The fact that erosion has been slow on these soils may account for their comparatively high position.

The upper part of the Fullerton soils is highly leached. The soils are medium to strongly acid throughout.

Typical profile of Fullerton silt loam:

- A_1 0 to 2 inches, dark grayish-brown (10YR 4/2) very friable silt loam; weak medium crumb structure.
- A_2 2 to 8 inches, light yellowish-brown or pale-brown (10YR 6/4 to 6/3) very friable silt loam; moderate medium granular structure.
- A_3 8 to 15 inches, reddish-yellow to strong-brown (7.5YR 6/6 to 5/6) friable heavy silt loam or light silty clay loam; moderate fine blocky structure.
- B_1 15 to 23 inches, yellowish-red (5YR 5/6) to reddish-yellow (7.5YR 6/6) friable silty clay loam; moderate to strong medium blocky structure.
- B_2 23 to 40 inches, red (2.5YR 4/8) or yellowish-red (5YR 5/8) firm silty clay; well-developed medium blocky structure.
- C 40 to 60 inches +, red to yellowish-red firm silty clay, irregularly streaked with gray, yellow, and brown; a few chert fragments occur throughout the soil, the quantity increasing with depth; in most places bedrock is at depths of more than 8 feet.

Hartsells Series.—The Hartsells soils have developed on residuum weathered from horizontally bedded sandstone in which there are thin lenses of shale. The soils have developed under a climate slightly cooler than that under which the valley soils have developed.

The textural profile of these soils is not highly developed. Nevertheless, the soils are sufficiently mature to be classified as zonal soils. The parent material is low in bases, a factor that may have contributed directly to the soils having developed a typical Red-Yellow Podzolic profile. The parent material has influenced the kind of vegetation growing on the soils. The native forest consisted mainly of oak, with some intermingled pines. The oak leaves are lower in bases than are the leaves of most deciduous trees, so less bases have been returned to the soil.

The Hartsells soils are well drained. They are strongly to very strongly acid.

Typical profile of Hartsells fine sandy loam:

- A_1 0 to 2 inches, dark grayish-brown to grayish-brown (10YR 4/2 to 5/2) very friable fine sandy loam.
- A_2 2 to 9 inches, yellowish-brown or light yellowish-brown (10YR 5/4 to 6/4) very friable fine sandy loam; weak medium granular or crumb structure.
- B_1 9 to 15 inches, yellowish-brown (10YR 5/6) friable light clay loam or fine sandy clay loam; weak fine blocky structure.
- B_2 15 to 32 inches, yellowish-brown or brownish-yellow (10YR 5/6 to 6/6) friable clay loam or sandy clay loam; weak fine and medium blocky structure.
- C 32 inches +, strong-brown (7.5YR 5/6) to yellowish-brown (10YR 5/6) sandy clay loam; contains a few small sandstone fragments and quartz pebbles; gradual transition to bedrock at 35 inches.

Linker Series.—The Linker soils have developed in residuum from acid, level-bedded sandstone. In some places the bedrock contains numerous, small, rounded quartz pebbles and appears to be fine-grained conglomerate. The Linker soils are closely associated with the Hartsells soils and in many places are intermingled with them. They differ from them chiefly in having a reddish B horizon and slightly less sand throughout. The differences between these two series appear to result from differences in parent material of the soils, as the soils have formed under the same conditions of relief, climate, and vegetation.

The Linker soils are well drained. They are strongly acid throughout.

Typical profile of Linker loam:

- A_1 0 to 2 inches, grayish-brown (10YR 5/2) very friable loam to fine sandy loam.
- A_2 2 to 8 inches, yellowish-brown (10YR 5/4) very friable loam; weak medium granular structure.
- A_3 8 to 18 inches, strong-brown (7.5YR 5/6) friable clay loam; weak fine blocky structure.
- B_2 18 to 26 inches, yellowish-red (5YR 5/6) friable clay loam; moderate medium blocky structure.
- B_3 or C 26 to 40 inches +, yellowish-red (5YR 4/6) friable sandy clay loam; a few yellowish-brown variegations below 32 inches, abrupt boundary with sandstone bedrock, which occurs at depths of 48 inches.

Minvale Series.—The Minvale soils have developed in old colluvium or in old local alluvium washed mainly from areas of Fullerton and Clarksville soils. The differences between the Minvale and Hermitage soils are apparently caused by differences in parent material and to some extent by differences in vegetation. The Minvale soils are similar to the Hermitage soils in position and degree of development, but they are lighter colored throughout. The parent material of the Minvale soils contains more insoluble material, mainly chert, which probably accounts for the higher degree of leaching.

The Minvale soils are well drained. They are strongly acid throughout.

Typical profile of Minvale silt loam:

- A_2 0 to 8 inches, pale-brown (10YR 6/3) very friable silt loam; weak fine granular structure; in virgin areas the upper 1 to 2 inches is grayish brown (10YR 5/2).
- A_3 8 to 11 inches, yellowish-brown (10YR 5/6) to strong-brown (7.5YR 5/6) friable silt loam; moderate medium granular structure.
- B_1 11 to 16 inches, strong-brown (7.5YR 5/8) friable light silty clay loam; moderate fine subangular blocky structure.
- B_2 16 to 36 inches, yellowish-red (5YR 5/8) moderately friable silty clay loam; moderately developed medium subangular blocky structure.
- B_3 36 to 56 inches, yellowish-red (5YR 4/8) moderately friable silty clay loam; a few fine, distinct brownish-yellow variegations; moderate medium subangular blocky structure; a few finely divided chert fragments are scattered throughout the profile.

Pace Series.—Like the Minvale soils, the Pace soils have developed in moderately old to old colluvium or in local alluvium. The materials have washed chiefly from the Fullerton and Clarksville soils. These soils are undulating to rolling. They were formed under a hardwood forest.

The Pace soils differ from the Minvale soils in having yellowish rather than reddish B horizons. They are not so well drained and are not so well aerated as the Minvale soils. Probably because of their low relief and their position at the bases of slopes where seepage is more than normal, some areas have incipient pan development at depths between 24 and 36 inches. The soils are strongly acid throughout.

The A horizon of Pace silt loam is pale-brown or light yellowish-brown very friable silt loam containing a small amount of finely divided chert fragments. This layer is 7 to 12 inches thick. The B horizon is brownish-yellow or yellowish-brown friable silty clay loam and is from 15 to 20 inches thick. The C horizon is mottled pale-yellow, yellowish-brown, and gray moderately firm silty clay loam. In most places the Pace soils are underlain by dolomitic limestone.

Sequatchie Series.—The soils of the Sequatchie series occupy low stream terraces or second bottoms along practically all of the larger creeks and rivers. Many areas in mountain coves occupy positions where the colluvial material has accumulated recently. The soils have developed from general mixed alluvium similar to that from which closely associated Staser soils originated, but they are older and have a moderately well developed profile.

The Sequatchie soils are nearly level to gently sloping. They have developed under a hardwood forest and under climatic conditions similar to those under which the other zonal soils of the valley developed. Some of the materials from which the soils were derived were so recently deposited that only weak profile development is apparent.

Typical profile of Sequatchie loam:

- A_1 0 to 2 inches, dark grayish-brown (10YR 4/2) very friable loam to fine sandy loam containing a fairly large amount of organic matter.
- A_2 2 to 11 inches, brown (7.5YR 4/4) to dark-brown (10YR 4/3) very friable loam; weak medium granular structure.
- B_2 11 to 32 inches, yellowish-brown (10YR 5/4) to strong-brown (7.5YR 5/6) friable clay loam; weakly developed medium and fine blocky structure.
- C 32 to 48 inches +, yellowish-brown (10YR 5/4) or strong-brown (7.5YR 5/6) friable sandy clay loam or clay loam with a few gray and yellow mottles; numerous pebbles and cobblestones at depths below 40 inches.

Swaim Series.—The Swaim soils are heavy textured. They were derived from old colluvium washed chiefly from uplands that are underlain by clayey limestone and occupied mainly by Colbert soils. The areas are small and widely separated. They occur at the bases of the slopes from which the parent materials were washed. The soils are closely associated with members of the Allen, Hermitage, and Hollywood series.

These soils are moderately well drained. They are medium acid. Some are highly susceptible to erosion, so they are of limited use.

Talbott Series.—The Talbott soils have developed in materials weathered from argillaceous limestone. They have fine-textured B and C horizons, which is characteristic of soils that developed from clayey parent materials. The Talbott soils are much thinner over bedrock than the Fullerton soils; their position, relief, and thickness suggest that the parent limestone weathers rapidly and leaves only a small amount of insoluble residue.

The Talbott soils are easily eroded when cultivated and may have eroded rather rapidly under natural vegetation. Erosion probably accounts in part for their thinness over bedrock. They have very little siliceous material and are practically free of chert. They are medium acid throughout.

The Talbott soils are closely associated with the Colbert soils. Their B horizon is more reddish than the lower part of the Colbert soils, and the Talbott soils are somewhat deeper over bedrock. The differences between these two series appear to result from differences in the parent material of the soils. The parent rock of the Colbert soils is somewhat shaly limestone and is probably lower in iron and manganese oxides than that of the Talbott soils.

Typical profile of Talbott silty clay loam:

- A_p 0 to 7 inches, brown (10YR 5/3) moderate friable silty clay loam; strong medium granular structure.
- B_2 7 to 24 inches, yellowish-red (5YR 5/6) very firm clay; strong coarse blocky structure.
- B_3 or C 24 inches +, yellowish-red (5YR 5/6) extremely firm clay or silty clay with irregular streakings of brownish yellow and yellowish brown; bedrock generally occurs at depths between 2 and 4 feet, but outcrops are common.

Waynesboro Series.—The Waynesboro series consists of well-developed soils derived from old deposits of alluvium. The deposits consist of general mixed alluvium, chiefly from sandstone, shale, and some limestone. The parent material is more siliceous and lower in bases than that of the Cumberland soils. This probably accounts for the higher degree of leaching and for the lighter color of the upper part of the Waynesboro profile. The B horizon of the Waynesboro soils is not so fine textured nor is it so red as that of the Cumberland soils. The characteristics of the Waynesboro parent material result in more rapid profile development than in soils derived from parent material consisting either of limestone residuum or alluvium chiefly from limestone. The Waynesboro soils are medium to strongly acid.

Typical profile of Waynesboro loam:

- A_1 0 to 1 inch, dark grayish-brown (10YR 4/2) very friable loam or nearly fine sandy loam.
- A_2 1 to 10 inches, brown (10YR 5/3) very friable loam; weak medium granular structure.
- A_3 10 to 18 inches, mixed brown (10YR 5/3) and yellowish-red (5YR 4/6) friable light clay loam; reddish yellow or strong brown when crushed into a mass; weak fine to medium blocky structure.
- B_2 18 to 30 inches, yellowish-red (5YR 4/6) to red (2.5YR 4/6) friable clay loam to fine sandy clay; moderate medium blocky structure.
- B_3 30 to 46 inches, red (2.5YR 4/8) friable clay loam or sandy clay loam; weak medium blocky structure; a few pebbles and cobblestones, mainly in the lower part.
- C 46 to 60 inches, yellowish-red friable clay loam or sandy clay loam, streaked or variegated with brownish yellow and yellowish brown; numerous pebbles and cobblestones.

Whitwell Series.—The Whitwell soils represented in this county by Whitwell loam, are closely associated with the Sequatchie soils. Like the Sequatchie soils, they have developed from moderately old stream alluvium consisting mainly of sandstone and shale materials but containing some limestone. The soils have developed under conditions of somewhat inferior drainage, probably partly because of their generally milder slopes and partly because of the higher water table. They are about the same age as the Sequatchie soils and have developed under similar conditions of climate and vegetation. The native hardwood forest, however, included some water-tolerant species, such as willows, water oaks, maples, and sycamores.

Typical profile of Whitwell loam:

- A_2 0 to 10 inches, yellowish-brown to pale-brown (10YR 5/4 to 6/3) very friable loam; in virgin areas the upper 2 inches is grayish brown (10YR 5/2).
- B_1 10 to 22 inches, brownish-yellow to yellowish-brown (10YR 6/6 to 5/6) friable light clay loam of weak fine blocky structure.
- B_2 22 to 34 inches, brownish-yellow (10YR 6/6) friable clay loam with a few mottles of gray and strong brown; weak medium blocky structure.
- C 34 to 50 inches +, mottled light-gray, strong-brown, and yellow friable fine sandy clay loam; predominantly gray at depths beginning at 50 inches.

Intrazonal soils

On some nearly level areas in Marion County, where both internal and external drainage are restricted or where geological erosion has been very slow, soils whose materials have been in place a long time have certain well-developed profile characteristics that zonal soils do not have. Such soils, which are associated geographically with zonal soils, are called intrazonal soils. The intrazonal soils are defined as soils with more or less well-developed characteristics that reflect the dominating influence of some local factor of relief, parent material, or age over the normal effect of climate and vegetation (*5*). In Marion County the intrazonal soils are Planosols.

PLANOSOLS

Planosols are intrazonal soils, which have one or more horizons abruptly separated from, and sharply contrasting to, an adjacent horizon because of cementation, compaction, or high clay content. The soils have developed under forest or grass vegetation. They occur in mesothermal to tropical perhumid to semiarid climates where usually, but not always, there is a fluctuating water table. In many places the cemented or compacted horizons lie beneath a moderately well developed or well developed B horizon that has a higher percentage of clay than the A horizon (*4*). In Marion County the Planosols are members of the Robertsville and Taft series.

Though the B horizon of the Planosols is denser or more compact than that of most zonal soils, its degree of development varies. The soils have developed under a climate similar to that under which the zonal soils developed, but the Planosols contain more moisture and are not so well aerated as the zonal soils. Some differences probably existed between the kinds of vegetation under which the Planosols and the Red-Yellow Podzolic soils developed, but both soils developed under a deciduous forest. The original forests on the Planosols contained a high proportion of water-tolerant trees.

In profile development the Planosols appear to be older than the Red-Yellow Podzolic soils. This is probably because of the level relief and the large amount of water percolating through the profile. Much of the pore space has become filled with clay and colloidal materials, and as a consequence a dense layer with impaired permeability has formed.

Robertsville Series.—The Robertsville soils, represented in Marion County by Robertsville silt loam, are poorly drained gray soils developed on old stream alluvium. They occupy nearly level to slightly depressed areas and have developed under a forest cover consisting of water-tolerant trees. Their parent materials were similar to those from which the Taft soil developed. Runoff is generally slower than that on the Taft soil, the compact layer is denser, and the A horizon is more strongly leached.

The following profile description is of a forested area of Robertsville silt loam that may have been cleared at one time. The trees, which include willow oak, water oak, sweetgum, hackberry, and maple, appear to be at least 25 years old.

- A_1 0 to 2 inches, grayish-brown (10YR 5/2) friable silt loam.
- A_2 2 to 10 inches, gray to light brownish-gray (10YR 6/1 to 6/2) friable floury silt loam, mottled with strong brown and containing an occasional small black concretion.
- B_{1m} 10 to 20 inches, light-gray (10YR 7/1) friable silty clay loam, variegated with irregular streaks of strong brown; contains many brown concretions; massive.
- B_{2m} 20 to 34 inches, light-gray (10YR 7/1) firm or compacted silty clay loam containing numerous soft yellowish-red concretions; massive or structureless; breaks to large irregular fragments.
- C_m 34 inches +, mottled gray, yellowish-red, and yellow very compact silty clay containing numerous soft black concretions.

Taft Series.—The Taft soils, represented in Marion County by Taft silt loam, have developed in old alluvium consisting chiefly of limestone materials. They occur on nearly level to slightly depressed areas in association with the Capshaw and Robertsville soils. The Taft soils are the somewhat poorly drained members of the catena that also includes the well drained

Etowah, the moderately well drained Capshaw, and the poorly drained Robertsville soils. They are about the same age as the Etowah and Capshaw soils and were derived from similar parent materials. The Taft soils are strongly acid throughout.

Typical profile of Taft silt loam:

A_1 0 to 2 inches, grayish-brown (10YR 5/2) friable silt loam.
A_2 2 to 8 inches, pale-brown (10YR 6/3) friable silt loam; moderate medium granular structure.
B_2 8 to 22 inches, brownish-yellow (10YR 6/6) moderately firm silty clay loam; light-gray and strong-brown mottles are few in the upper part, but are more numerous in the lower part.
B_{2m} 22 to 42 inches, mottled light-gray, yellow, and yellowish-brown firm silty clay loam; contains numerous small black concretions, which are probably oxides of iron and manganese; breaks to large irregular fragments with indistinct natural cleavage lines.
C_m 42 inches +, mottled gray, yellow, and brown, but predominantly gray, firm silty clay to silty clay loam; massive or structureless; contains numerous chert fragments and pebbles.

Azonal soils

In areas in Marion County where the parent material has been in place for only a short time, as is true of the recently transported materials, the soils have poorly defined or no genetic horizons. This is because well-developed profiles have not had time to develop or because extreme conditions of relief or parent material have kept the normal profile from developing.

The azonal soils have moderately dark colored A_1 horizons in which there is a moderately high to fairly high content of organic matter. They have no B horizon. In most places their parent material is lighter in color than the A_1 horizon, but it may be similar to, or of a different texture than, the A_1 horizon. These soils are called AC soils because of the absence of a B horizon.

The relief of the azonal soils ranges from nearly level to very steep. On the steep slopes, where only a small amount of water percolates through the soil and a large amount runs off at a rapid rate, the runoff contributes to the fairly rapid geologic erosion. The soils are young because materials are constantly renewed or mixed, and the changes brought about by vegetation and climate may be so slight that the soils are essentially AC soils.

In Marion County the azonal soils are Lithosols or belong to the Alluvial great soil group.

LITHOSOLS

Lithosols are an azonal group of soils, which have an incomplete solum or no clearly expressed soil morphology. They consist of a freshly and imperfectly weathered mass or hard rock or rock fragments (*4*). They are largely confined to steeply sloping land, and erosion is therefore rather rapid. The soils generally consist of easily eroded materials. Consequently, much soil is removed from the surface or is mixed to such an extent that soil-forming processes do not have a sufficient length of time to act on them and to produce well-defined soil profiles. In Marion County the Armuchee, Colbert, and Muskingum soils have been classified as Lithosols.

Armuchee Series.—The Armuchee soils are shallow azonal soils derived from the residuum of interbedded limestone and calcareous shale. The shale is predominant. In places, it appears to grade to limestone.

The Armuchee soils occupy areas of steep relief, and this, together with the slowly weathering bedrock, has resulted in rapid geologic erosion and shallow soil profiles. Erosion has closely followed soil formation, and the material has not been in place long enough to develop soil horizons.

In most places these shallow soils have a light brownish-gray silty clay loam surface soil, which contains numerous shale fragments. This layer is about 5 to 10 inches thick. It rests on the unweathered bedrock.

Colbert Series.—The Colbert soil is a shallow, fine-textured, plastic soil over argillaceous limestone bedrock. The extremely heavy clayey parent material apparently is residuum that has accumulated very slowly from a rather pure carbonate rock. Percolation of water through the soil is very slow, and the soil is not well aerated. These characteristics, causing slow leaching or removal of soluble materials by percolation and rapid geologic erosion, have greatly retarded the development of the soil profile. On the smoother parts, where geologic erosion has been less active, the soil has a moderately developed profile similar to that of a Red-Yellow Podzolic soil.

Typical profile of Colbert silty clay loam on a sloping area:

A_p 0 to 6 inches, grayish-brown (10YR 5/2) firm silty clay loam; under virgin conditions, the upper 1 to 2 inches is stained dark with organic matter.
C 6 to 16 inches, brownish-yellow (10YR 6/6) extremely firm silty clay or clay; layer rests upon the unweathered limestone bedrock.

Muskingum Series.—The Muskingum soils are shallow azonal soils. They were derived from the residuum of weathered acid sandstone, interbedded in some places with thin layers of shale. They show little evidence of a genetic morphology. The steep relief favors rapid geologic erosion, and the parent rock is resistant to weathering.

These soils do not have a B horizon. In most places they have a thin layer of forest litter (A_0) on the surface. The A_1, or organic-mineral horizon, is 1 to 2 inches thick; and the yellowish-brown or brownish-yellow very friable fine sandy loam at depths between 8 and 15 inches overlies unweathered sandstone.

ALLUVIAL SOILS

Alluvial soils are an azonal group of soils developed from transported and rather recently deposited material (alluvium); they are characterized by weak or by no modification through soil-forming processes (*5*). In Marion County these soils occur on first bottoms along streams, in depressions, and along drainageways. They are nearly level or gently sloping and have medium to very slow internal drainage. They have the properties common to soils that lack a profile in which there are genetically related horizons.

Though derived from similar parent materials, the

soils differ in drainage and, as a result, they develop different soil characteristics. Alluvial soils derived from similar parent material but differing in drainage have been differentiated mainly on the basis of properties associated with good, imperfect, or poor drainage.

The Alluvial soils in Marion County are members of the Cotaco, Atkins, Barbourville, Bruno, Emory, Greendale, Hamblen, Hollywood, Huntington, Lindside, Melvin, Prader, and Staser series.

Cotaco and Atkins Series.—The Cotaco and Atkins soils were derived from alluvium or colluvium from acid sandstone. They occur in narrow bands along intermittent drainageways or are in saucerlike depressions near the heads of drains. These soils are very strongly acid. They are low in organic matter and low in plant nutrients.

Barbourville Series.—The Barbourville series consists of deep well-drained soils made up of recent local alluvium or colluvium. The parent materials have washed or rolled from soils derived mainly from sandstone and shales, but, some areas have a small proportion of limestone materials. The soils occur on foot slopes, fans, and along narrow drainageways. They have little or no horizon development. They are similar to the Greendale soils in position and age but are sandier and more strongly acid throughout.

Typical profile of Barbourville loam:

0 to 10 inches, yellowish-brown to brown (10YR 5/4 to 5/3) very friable loam; texture ranges to fine sandy loam in places; in wooded areas the upper 1 to 2 inches is dark grayish brown to very dark grayish brown.
10 to 36 inches, yellowish-brown (10YR 5/4 to 5/6) friable loam, which grades to clay loam in places; a few gray and yellow mottlings occur below 30 inches.
36 inches +, yellowish-brown (10YR 5/6) friable loam to light clay loam with many, fine, distinct pale-yellow and olive-yellow mottles.

Bruno Series.—The Bruno soils are represented in Marion County by Bruno loamy fine sand. This soil has developed from alluvium washed chiefly from soils underlain by sandstone, although some limestone materials are included. It occupies almost level flood plains. Most of the areas are along the Sequatchie and Little Sequatchie Rivers. The soil is medium to strongly acid. Its content of organic matter and plant nutrients is low.

Emory Series.—The Emory soils are represented in Marion County by Emory silt loam. This soil consists of recent local alluvium or colluvium washed or rolled from reddish soils that have developed from limestone. The Emory soil is similar to the Greendale soils in position and age; it differs from them mainly in having a darker colored profile. The Emory soil is also more fertile.

This soil occurs on fans, on foot slopes, and on narrow strips along intermittent drainageways. The areas on the floors of depressions are nearly level, but most of the acreage occupies slightly higher positions and has a very mild slope. This soil is well drained. It has little or no horizon development.

Typical profile of Emory silt loam:

0 to 20 inches, dark-brown (7.5YR 4/2 to 3/2) very friable granular silt loam; color ranges to reddish brown in places.
20 to 40 inches, reddish-brown (5YR 4/3) friable heavy silt loam; color is brown, dark brown, or dark reddish brown in some places.
40 inches +, this layer ranges from reddish brown to yellowish brown in color and from silt loam to silty clay loam in texture; shows a few yellow or gray mottles in places.

Greendale Series.—The Greendale soils occur on foot slopes, along narrow intermittent drainageways, and on local alluvial-colluvial fans. They have formed from materials washed from adjacent slopes. In Marion County the materials were washed mainly from the Fullerton and Clarksville soils. This material is more siliceous, more strongly acid, lower in bases, and less fertile than that from which the Emory soil originated. The Greendale soils are generally so young and have such weakly developed profiles that they are included with the Alluvial soils. Nevertheless, some incipient profile development is evident in some areas.

The soils are well drained. They are medium to strongly acid.

Typical profile of Greendale silt loam:

0 to 15 inches, pale-brown to brown (10YR 6/3 to 5/3) very friable silt loam; weak medium granular structure; in virgin areas the upper 1 to 2 inches is stained dark by a considerable amount of partly disintegrated organic matter.
15 to 36 inches, yellowish-brown (10YR 5/4) friable silt loam; a few fine faint yellow mottles in lower part.
36 inches +, brownish-yellow (10YR 6/6) friable light silty clay loam; common fine mottlings of yellow and gray.

Hollywood Series.—The Hollywood soils are represented in Marion County by Hollywood silty clay loam. This soil was formed from alluvium or colluvium derived from argillaceous limestone. The soil normally occurs at the bases of the stony and rocky limestone slopes from which its soil materials were washed. The areas are small and widely separated.

This soil is neutral to slightly acid. It is high in organic matter and is moderately well supplied with plant nutrients.

Huntington, Lindside, and Melvin Series.—The Huntington, Lindside, and Melvin series constitute a catena of soils derived from mixed general alluvial material in which limestone materials appear to dominate. They are generally only slightly acid, and some are nearly neutral. The Huntington soils are well drained, the Lindside imperfectly drained, and the Melvin poorly drained. These soils are young or very young and have little or no profile development. In some places very recent deposits of alluvium are on the surface. Exposure of the profile shows a somewhat older darker colored surface layer at depths ranging from 15 to 25 inches. All of these soils are typically stratified, and all are subject to flooding and deposition.

Huntington Series

Typical profile of Huntington silt loam:

0 to 12 inches, dark-brown to dark grayish-brown (10YR 4/3 to 4/2) friable granular silt loam.
12 to 30 inches, brown to dark-brown (10YR 5/3 to 4/3) friable silt loam that breaks into small irregular fragments.
30 to 50 inches +, dark yellowish-brown to dark-brown (10YR 4/4 to 4/3) friable silt loam; a few gray mottlings may appear at depths below 30 to 36 inches.

Lindside Series

The material in the uppermost 15 to 18 inches of the Lindside soil resembles that in the uppermost 15 to 18 inches of the Huntington soils. The Lindside soil differs from the Huntington chiefly in having gray and yellow mottlings below depths of 15 to 18 inches. In many places the Lindside soil is finer textured and of a little firmer consistence than the Huntington soils. The Lindside soil generally occurs nearer the rims of flood plains than the Huntington, in areas where finer sediments from slower moving water have been deposited.

Typical profile of Lindside silt loam:

0 to 15 inches, dark grayish-brown to grayish-brown (10YR 4/2 to 5/2) silt loam.
15 to 24 inches, dark yellowish-brown (10YR 4/4) friable heavy silt loam, lightly mottled with gray and strong brown.
24 to 48 inches +, mottled gray, yellow, and brown moderately friable heavy silt loam; gray color increases with depth; predominantly gray at depths of 48 inches.

Melvin Series

The Melvin soil is classified as an Alluvial soil in which a gley horizon occurs. In most places the entire profile is grayer than that of the Huntington or Lindside soil, and the subsoil is decidedly gray. The poor aeration of the lower part of the profile is largely caused by periodically high water. The Melvin soil is generally finer in texture and is a little firmer than the Huntington soils. It commonly occurs along the rims of flood plains where finer sediments have been deposited. Some areas have taken on some characteristics of a Planosol; that is, the subsoil is more compact and clayey than the surface layer.

Typical profile of Melvin silty clay loam:

0 to 7 inches, grayish-brown (10YR 5/2) moderately friable silty clay loam containing a few strong-brown mottlings; in virgin areas the upper 1 to 2 inches contains a considerable amount of partly disintegrated organic matter.
7 to 28 inches, gray (10YR 6/1 to 5/1) firm silty clay loam; many irregular strong-brown streaks; some streaks appear to be stains from old root channels; material breaks into medium-sized irregular fragments.
28 to 48 inches +, gray (10YR 6/1 to 5/1) firm silty clay loam; silty clay in some places; massive or structureless; contains a few strong-brown streaks and stains.

Staser, Hamblen and Prader Series.—The Staser, Hamblen, and Prader soils make up a catena of soils consisting of young mixed general alluvium that originated largely from shale and sandstone. The parent materials of these soils are less affected by limestone than are those of soils of the Huntington catena. In general, the soils of the Staser catena are lighter colored, less productive, and slightly more acid than those of the Huntington. They also generally have a somewhat higher content of sand. The Staser soils are well drained; the Hamblen, imperfectly drained; and the Prader, poorly drained. All of these soils are subject to flooding, so they receive fresh deposits of alluvial material from time to time.

Staser Series

Typical profile of Staser fine sandy loam:

0 to 12 inches, brown to yellowish-brown (10YR 5/3 to 5/4) very friable, nearly loose, fine sandy loam.
12 to 38 inches, grayish-brown to light yellowish-brown (10YR 5/2 to 5/3) very friable fine sandy loam to very fine sandy loam.
38 to 50 inches, about the same color as layer immediately above, but a few distinct gray and yellow mottles.

The texture of this soil varies from fine sandy loam to nearly a silt loam.

Hamblen Series

The material in the uppermost 15 or 16 inches of the Hamblen profile is similar to that in the Staser soil. The Staser soil is somewhat poorly aerated and, consequently, it is mottled below depths of 15 to 16 inches. Generally, the Hamblen soil is finer textured than the Staser.

Typical profile of Hamblen loam:

0 to 13 inches, yellowish-brown to brown (10YR 5/4 to 5/3) very friable loam.
13 to 28 inches, grayish-brown to yellowish-brown (10YR 5/2 to 5/4) friable loam with many distinct olive-gray and yellow mottles; gray mottlings increase with depth and form the matrix color at about 30 to 36 inches.
28 to 48 inches, mottled brown, yellow, and gray, but predominantly gray, friable loam to sandy loam; texture is silt loam or heavy silt loam in some places.

Prader Series

The Prader soil is poorly drained and poorly aerated. It is predominantly gray throughout. It generally has a finer texture than either the Staser or Hamblen soils.

Typical profile of Prader silt loam:

0 to 7 inches, dark yellowish-brown (10YR 4/4) friable silt loam with a few light olive-gray mottles and strong-brown stains.
7 inches +, olive-gray (5YR 5/2) or gray (10YR 6/1) moderately plastic heavy silt loam; contains a few strong-brown and brownish-yellow streaks and stains.

Soil Survey Methods and Definitions

The scientist who makes a soil survey examines soils in the field, classifies the soils in accordance with facts that he observes, and maps their boundaries on an aerial photograph or other map.

FIELD STUDY.—The soil surveyor bores or digs many holes to see what the soils are like. The holes are not spaced in a regular pattern, but are located according to the lay of the land. Usually they are not more than a quarter of a mile apart, and sometimes they are much closer. In most soils such a boring or hole reveals several distinct layers, called horizons, which collectively are known as the soil profile. Each layer is studied to see how it differs from others in the profile and to learn the things about the soil that influence its capacity to support plant growth.

Color is usually related to the amount of organic matter. The darker the surface soil, as a rule, the more organic matter it contains. Streaks and spots of gray, yellow, and brown in the lower layers generally indicate poor drainage and poor aeration.

Texture, or the content of sand, silt, and clay, is determined by the way the soil feels when rubbed between the fingers. Texture is later checked by laboratory analysis. Texture determines how well the

soil retains moisture, plant nutrients, and fertilizer, and whether it is easy or difficult to cultivate.

Structure, which is the way the individual soil particles are arranged in larger grains and the amount of pore space between grains, gives us clues to the ease or difficulty with which the soil is penetrated by plant roots and by moisture.

Consistence, or the tendency of the soil to crumble or to stick together, indicates whether it is easy or difficult to keep the soil open and porous under cultivation.

Other characteristics observed in the course of the field study and considered in classifying the soil include the following: The depth of the soil over bedrock or compact layers; the presence of gravel or stones in amounts that will interfere with cultivation; the steepness and pattern of slopes; the degree of erosion; the nature of the underlying rocks or other parent material from which the soil has developed; and acidity or alkalinity of the soil as measured by chemical tests.

CLASSIFICATION.—On the basis of the characteristics observed by the survey team or determined by laboratory tests, soils are classified into phases, types, and series. The soil type is the basic classification unit. A soil type may consist of several phases. Types that resemble one another in most of their characteristics are grouped into soil series.

Soil type.—The soil type is a subdivision of the soil series based on the texture of the surface soil.

Soil phase.—Some soil types are divided into two or more phases. Slope variations, frequency of rock outcrops, degree of erosion, depth of soil over the substratum, or natural drainage, are examples of characteristics that suggest dividing a soil type into phases.

The soil phase (or the soil type if it has not been subdivided) is the unit shown on the soil map. It is the unit that has the narrowest range of characteristics. Use and management practices therefore can be specified more easily than for soil series or yet broader groups that contain more variation.

Soil series.—Two or more soil types that differ in surface texture but are otherwise similar in kind, thickness, and arrangement of soil layers, are normally designated as a soil series. In a given area, however, it frequently happens that a soil series is represented by only one soil type. Each series is named for a place near which the soil was first mapped.

As an example of soil classification, consider the Fullerton series. This series is made up of three soil types, two of which are subdivided into phases, as follows:

Series	*Type*	*Phase*
Fullerton	Silt loam	Hilly phase.
		Eroded hilly phase.
		Eroded rolling phase.
	Cherty silt loam	Hilly phase.
		Eroded hilly phase.
		Steep phase.
		Eroded steep phase.
		Rolling phase.
		Eroded rolling phase.
	Cherty silty clay loam	Severely eroded hilly phase.

Miscellaneous land types.—Fresh stream deposits and rough, stony, and severely gullied land have little true soil and therefore are not classified into types and series. They are identified by descriptive names, such as Rockland, limestone; Gullied land, limestone soil materials; or Stony hilly and rolling land, limestone.

Soil complex.—When two or more soils are so intricately associated in small areas that it is not feasible to show them separately on the soil map, they are mapped together and called a soil complex. An example is Cotaco and Atkins silt loams.

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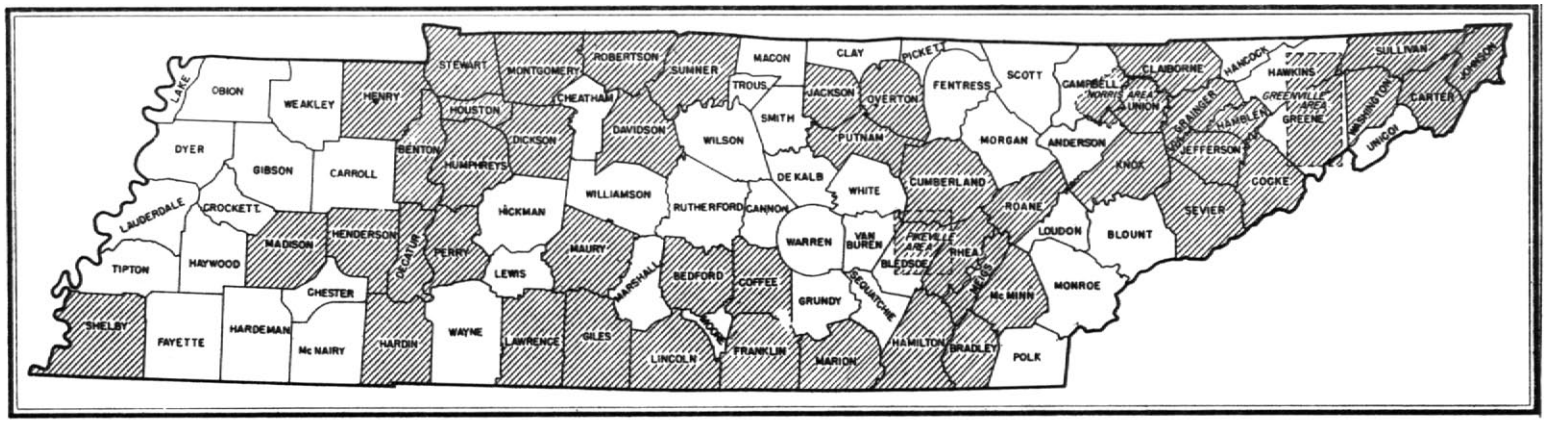

Areas surveyed in Tennessee shown by shading.

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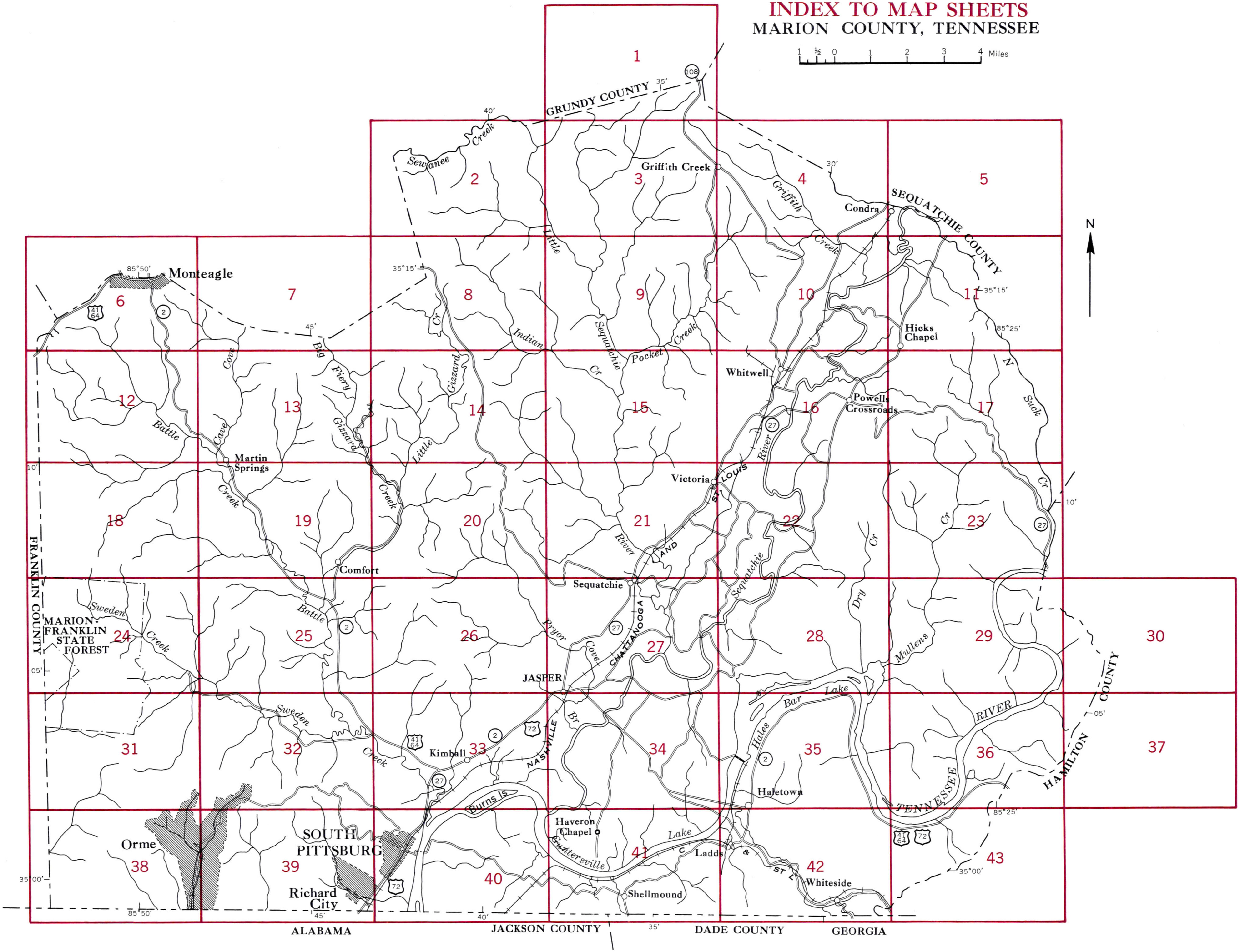
INDEX TO MAP SHEETS
MARION COUNTY, TENNESSEE



U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

MARION COUNTY, TENNESSEE

TENNESSEE AGRICULTURAL EXPERIMENT STATION
TENNESSEE VALLEY AUTHORITY

SOILS LEGEND

SYMBOL	NAME
Aa	Allen clay loam, severely eroded hilly phase
Ab	Allen fine sandy loam, eroded rolling phase
Ac	Allen fine sandy loam, eroded hilly phase
Ad	Allen stony fine sandy loam, eroded rolling phase
Ae	Allen stony fine sandy loam, hilly phase
Af	Allen stony fine sandy loam, eroded hilly phase
Ag	Armuchee silty clay loam, hilly phase
Ah	Armuchee silty clay loam, steep phase
Ba	Barbourville loam
Bb	Barbourville stony fine sandy loam
Bc	Bolton silt loam, eroded rolling phase
Bd	Bolton silt loam, hilly phase
Be	Bolton silt loam, eroded hilly phase
Bf	Bolton silty clay loam, severely eroded hilly phase
Bg	Bouldery colluvium, Allen soil material
Bh	Bruno loamy fine sand
Ca	Capshaw silt loam, undulating phase
Cb	Capshaw silt loam, eroded undulating phase
Cc	Capshaw silt loam, eroded rolling phase
Cd	Clarksville cherty silt loam, rolling phase
Ce	Clarksville cherty silt loam, hilly phase
Cf	Clarksville cherty silt loam, steep phase
Cg	Cobbly alluvium, Staser and Sequatchie soil materials
Ch	Colbert silty clay loam, eroded rolling phase
Ck	Cotaco and Atkins silt loams
Cl	Crossville loam, rolling phase
Cm	Cumberland silty clay loam, eroded undulating phase
Cn	Cumberland silty clay loam, eroded rolling phase
Co	Cumberland silty clay loam, eroded hilly phase
Cp	Cumberland silty clay loam, severely eroded hilly phase
Ea	Emory silt loam
Eb	Etowah silty clay loam, eroded undulating phase
Ec	Etowah silty clay loam, eroded rolling phase
Ed	Etowah silty clay loam, severely eroded rolling phase
Ee	Etowah silty clay loam, eroded hilly phase
Ef	Etowah silty clay loam, severely eroded hilly phase
Fa	Fullerton cherty silt loam, rolling phase
Fb	Fullerton cherty silt loam, eroded rolling phase
Fc	Fullerton cherty silt loam, hilly phase
Fd	Fullerton cherty silt loam, eroded hilly phase
Fe	Fullerton cherty silt loam, steep phase
Ff	Fullerton cherty silt loam, eroded steep phase
Fg	Fullerton cherty silty clay loam, severely eroded hilly phase
Fh	Fullerton silt loam, eroded rolling phase
Fk	Fullerton silt loam, hilly phase
Fl	Fullerton silt loam, eroded hilly phase
Ga	Greendale cherty silt loam
Gb	Greendale silt loam
Gc	Gullied land, limestone soil materials
Ha	Hamblen loam
Hb	Hartsells fine sandy loam, undulating phase
Hc	Hartsells fine sandy loam, eroded undulating phase
Hd	Hartsells fine sandy loam, rolling phase
He	Hartsells fine sandy loam, eroded rolling phase
Hf	Hermitage silt loam, eroded undulating phase
Hg	Hermitage silt loam, eroded rolling phase
Hh	Hollywood silty clay loam
Hk	Huntington fine sandy loam
Hl	Huntington loam
Hm	Huntington silt loam
Ja	Jefferson fine sandy loam, rolling phase
Jb	Jefferson fine sandy loam, eroded rolling phase
La	Lindside silt loam
Lb	Linker loam, rolling phase
Lc	Linker loam, eroded rolling phase
Ma	Melvin silty clay loam
Mb	Minvale cherty silt loam, eroded rolling phase
Mc	Minvale silt loam, eroded undulating phase
Md	Minvale silt loam, eroded rolling phase
Me	Muskingum stony fine sandy loam, rolling phase
Mf	Muskingum stony fine sandy loam, hilly phase
Mg	Muskingum stony fine sandy loam, steep phase
Pa	Pace cherty silt loam, eroded rolling phase
Pb	Pace cherty silt loam, eroded hilly phase
Pc	Pace silt loam, eroded undulating phase
Pd	Prader silt loam
Ra	Robertsville silt loam
Rb	Rockland, limestone
Rc	Rockland, sandstone
Sa	Sequatchie cobbly fine sandy loam, undulating phase
Sb	Sequatchie cobbly fine sandy loam, eroded undulating phase
Sc	Sequatchie cobbly fine sandy loam, eroded rolling phase
Sd	Sequatchie fine sandy loam, undulating phase
Se	Sequatchie fine sandy loam, eroded undulating phase
Sf	Sequatchie loam, undulating phase
Sg	Sequatchie loam, eroded undulating phase
Sh	Sequatchie loam, eroded rolling phase
Sk	Staser cobbly fine sandy loam
Sl	Staser fine sandy loam
Sm	Staser loam
Sn	Stony hilly and rolling land, limestone
So	Swaim silty clay, severely eroded rolling phase
Sp	Swaim silty clay loam, eroded undulating phase
Ta	Taft silt loam
Tb	Talbott silty clay, severely eroded rolling phase
Tc	Talbott silty clay loam, eroded rolling phase
Td	Talbott and Colbert silty clay loams, eroded undulating phase
Wa	Waynesboro clay loam, severely eroded rolling phase
Wb	Waynesboro clay loam, severely eroded hilly phase
Wc	Waynesboro cobbly fine sandy loam, rolling phase
Wd	Waynesboro cobbly fine sandy loam, eroded rolling phase
We	Waynesboro cobbly fine sandy loam, hilly phase
Wf	Waynesboro cobbly fine sandy loam, eroded hilly phase
Wg	Waynesboro loam, eroded undulating phase
Wh	Waynesboro loam, eroded rolling phase
Wk	Waynesboro loam, hilly phase
Wl	Waynesboro loam, eroded hilly phase
Wm	Whitwell loam
Wn	Wolftever silt loam, undulating phase

Soils surveyed 1948-50 by Joe A. Elder, Ernest K. Yates, and Irvin B. Epley, Tennessee Agricultural Experiment Station. Correlation by Lester E. Odom, U. S. Department of Agriculture.

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Roads
- Good motor
- Poor motor
- Trail
- Marker, U. S. (33)

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferry
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church
- Station

Mine and Quarry
- Shaft
- Dump
- Tunnel
- Pits, gravel or other

Power line

Pipeline

Cemetery

Dam

Levee

Tank

Forest fire station

Windmill

Canal lock (point upstream)

BOUNDARIES

- National or state
- County
- Township, civil
- U. S.
- Section
- City (corporate)
- Reservation
- Land grant

DRAINAGE

Streams
- Perennial
- Intermittent, unclass.
- Crossable with tillage implements
- Not crossable with tillage implements

Canals and ditches (CANAL / DITCH)

Lakes and ponds
- Perennial
- Intermittent

Wells (flowing)

Springs

Marsh

Wet spot

RELIEF

Escarpments
- Bedrock
- Other

Prominent peaks

Depressions

	Large	Small
Crossable with tillage implements		
Not crossable with tillage implements		
Contains water most of the time		

SOIL SURVEY DATA

- Soil type outline and symbol (Dx)
- Gravel
- Stones
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land

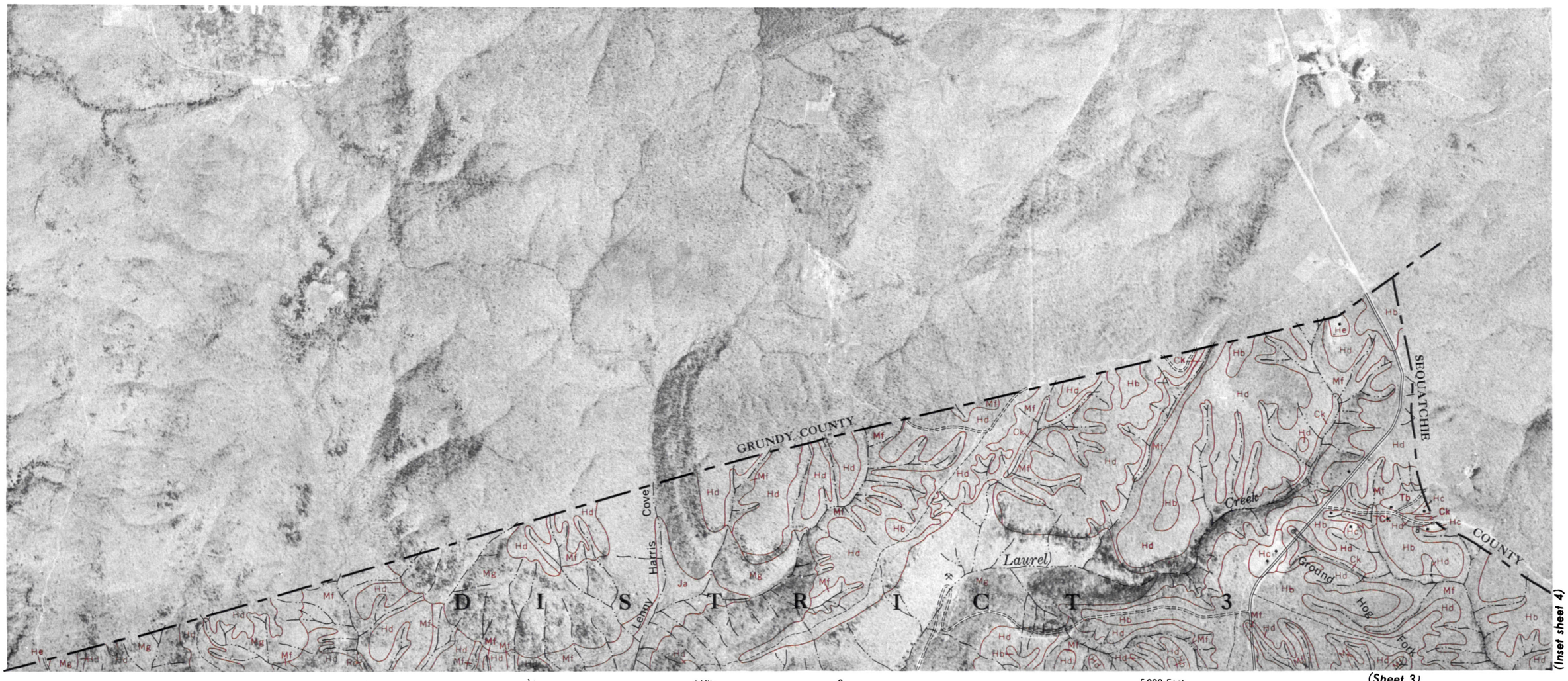
Erosion
- Spot less eroded than normal for this soil — K
- Sheet, moderate — S
- Sheet, severe — SS
- Gully, moderate — G
- Gully, severe — GG
- Sheet and gully, moderate — SG
- Wind, moderate
- Wind, severe
- Blowout
- Wind hummock
- Overblown soil
- Gullies

Areas of alkali and salts (A M S)
- Strong
- Moderate
- Slight
- Free of toxic effect — F
- Sample location — 26
- Saline spot

Soil map constructed by Cartographic Division, Soil Conservation Service, USDA, from 1951 aerial photographs. Controlled mosaic based on polyconic projection, 1927 North American datum.

1

N



0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

N

GRUNDY COUNTY

GRUNDY COUNTY

Sequatchie Creek

Bone Ridge

Nunley School

Greentown

Little Sequatchie

DISTRICT 3

CUMBERLAND PLATEAU

Brown Hollow School

Brown Hollow

Ridge

Bryant

Dykes Hollow

Mill Creek

Little Mill Creek

BRYANT COVE

Robert

Caney Point

Scrum Branch Creek

(Sheet 3)

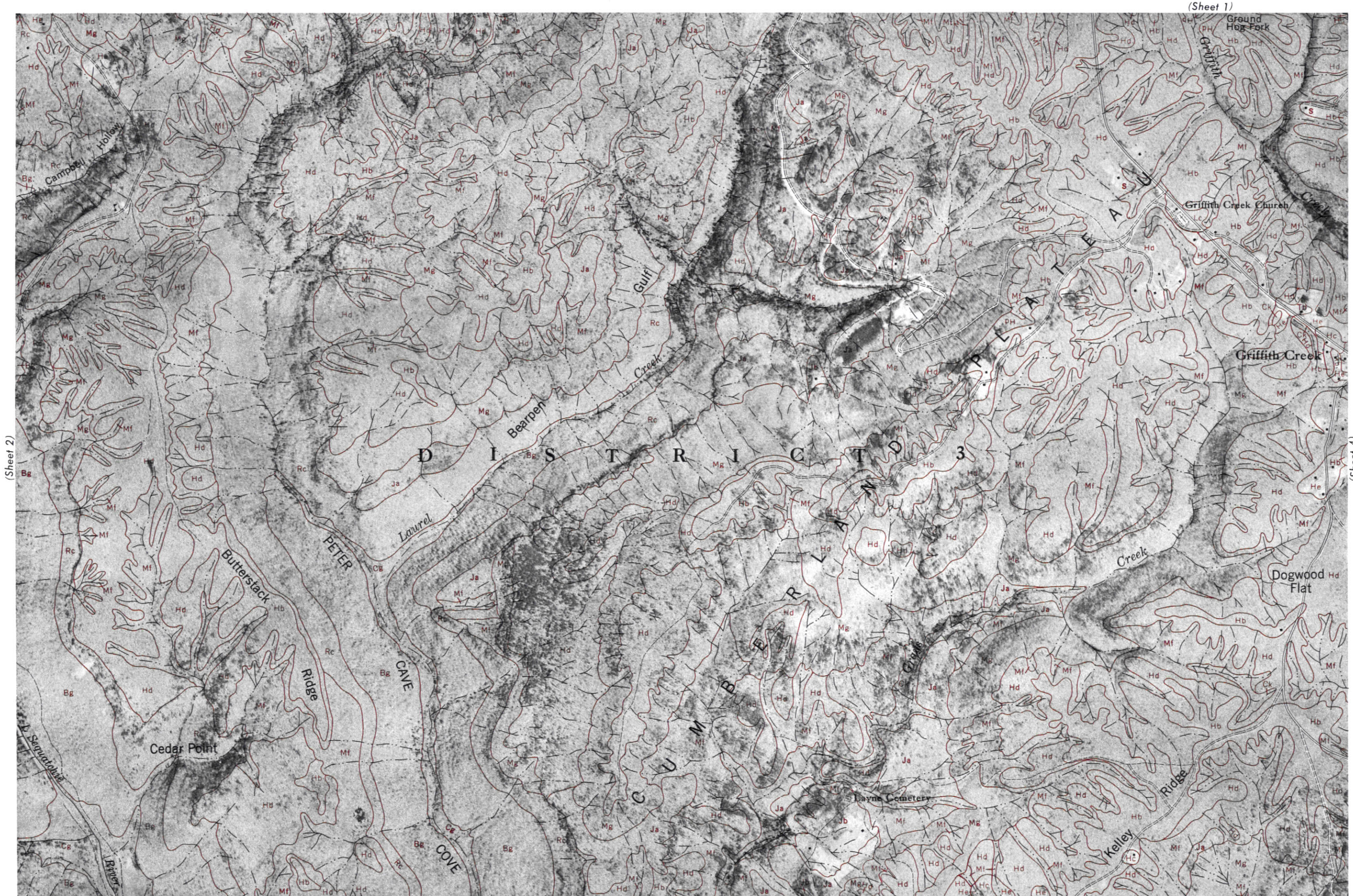
(Sheet 8)

0 ½ 1 Mile

Scale 1:20000

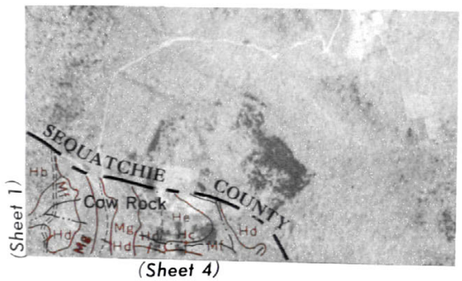
0 5000 Feet

(Sheet 1)


N
Ground Hog Fork
Griffith
Griffith Creek Church
Griffith Creek
PLATEAU
DISTRICT 3
CUMBERLAND
Campbell Hollow
Gulf
Creek
Bearpen
Laurel
PETER
CAVE
Ridge
Butterstack
Cedar Point
Sequatchie
River
COVE
Creek
Dogwood Flat
Layne Cemetery
Kelley
Ridge
(Sheet 2)
(Sheet 4)
(Sheet 9)
0
½
1 Mile
Scale 1:20000
0
5000 Feet

(Inset to right)

N



SEQUATCHIE COUNTY

CUMBERLAND PLATEAU DISTRICT 3

Brymich
Horseshoe
Glade
Griffith
Branch
Creek
Robinson
Falls
Branch
Hendrix
Creek
Pocket
Creek
Hammock
Cove
Reel
Creek
Cove
Second Branch
Griffith
Daniel
Daniel Spring
Griffith Cemetery
Creek
Cedar Spring Church
NC AND STL

(Sheet 3)
(Sheet 10)
(Sheet 5)

0 ½ 1 Mile

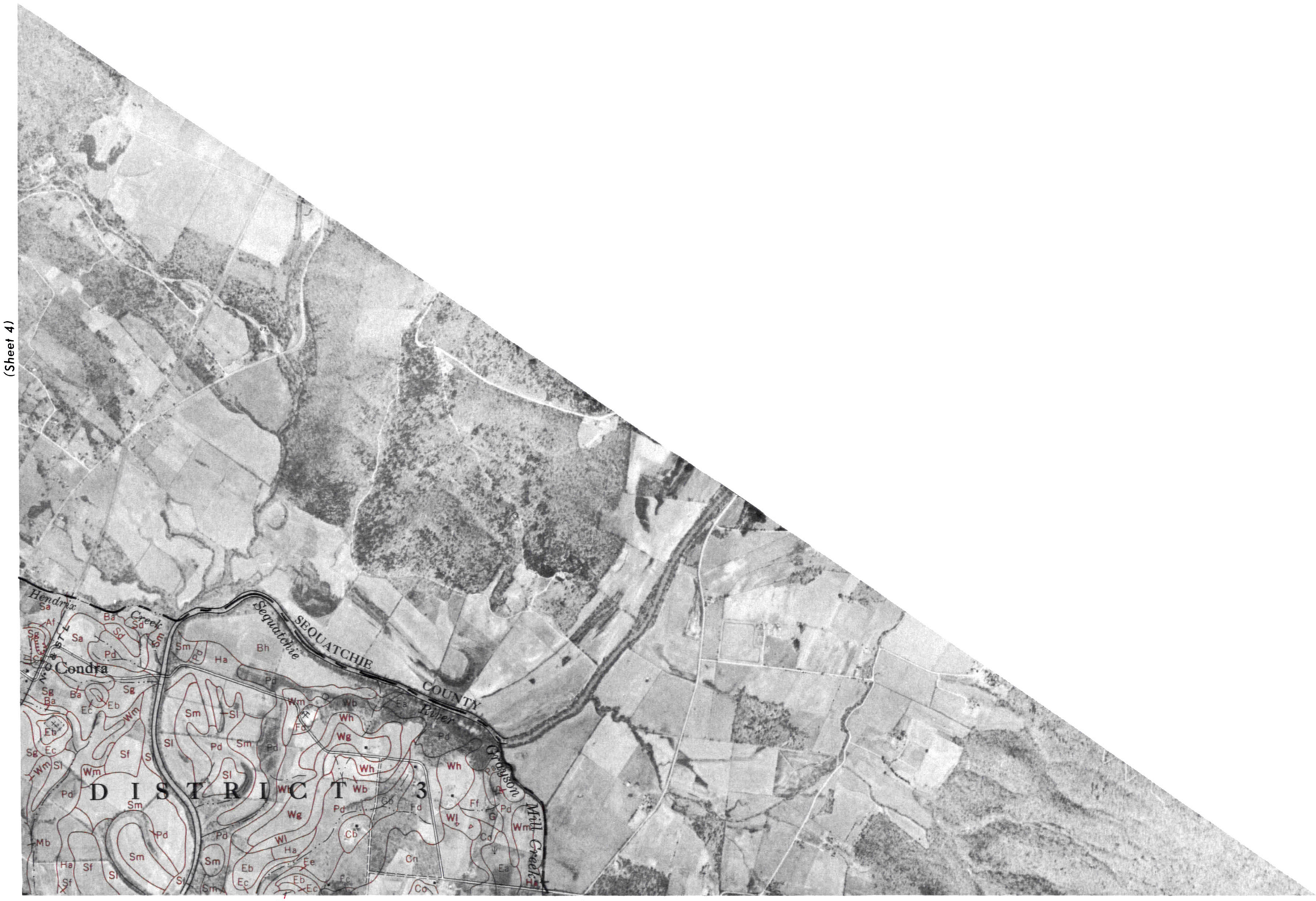
Scale 1:20000

0 5000 Feet

5

N

(Sheet 4)



0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 11)

6

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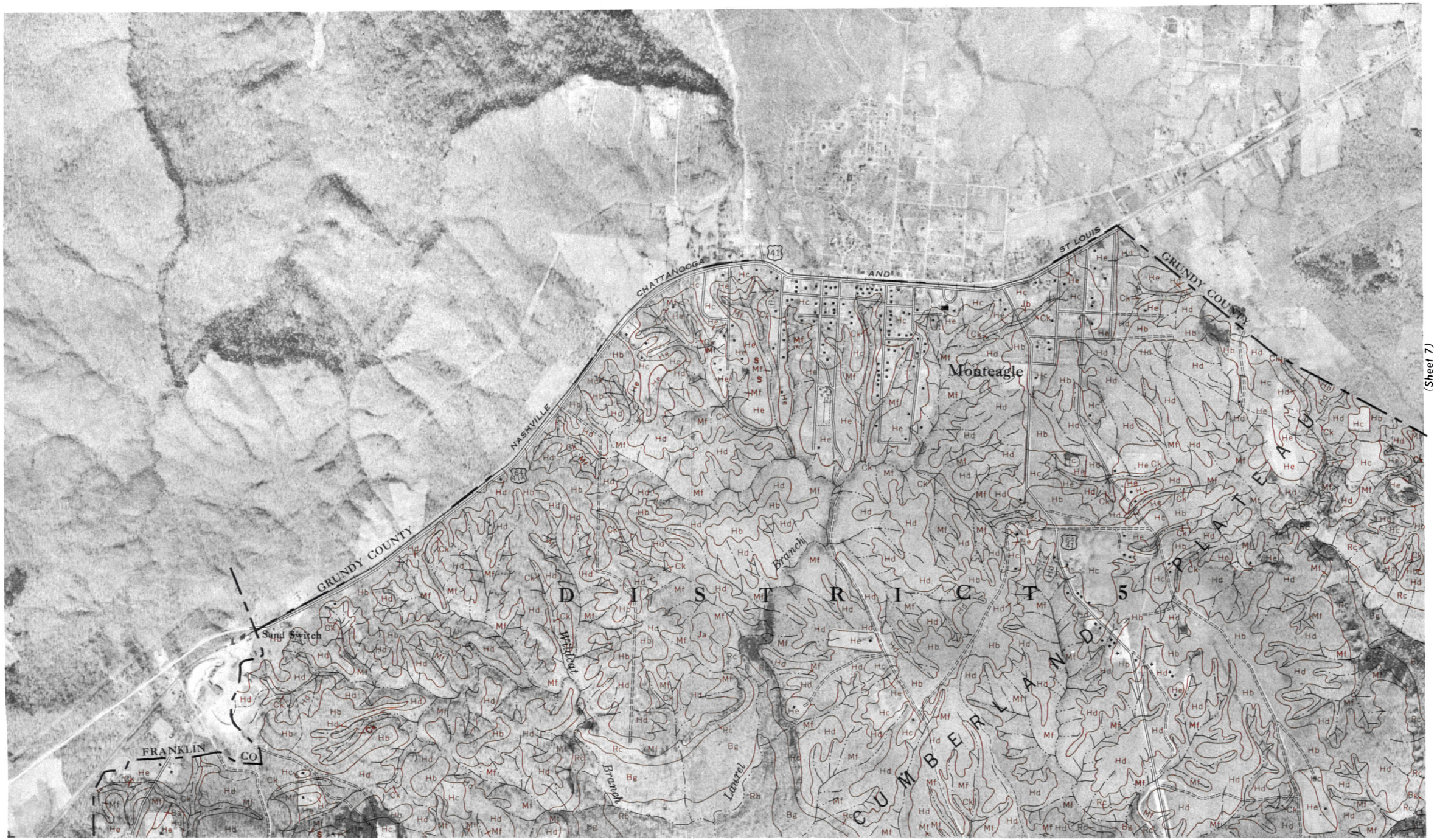


(Sheet 7)

(Sheet 12)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

N

(Sheet 6)

(Sheet 8)

Montea gle

Cove

DISTRICT 5

GRUNDY COUNTY

Raven Point

McMurray

DISTRICT 3

(Sheet 13)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(8)

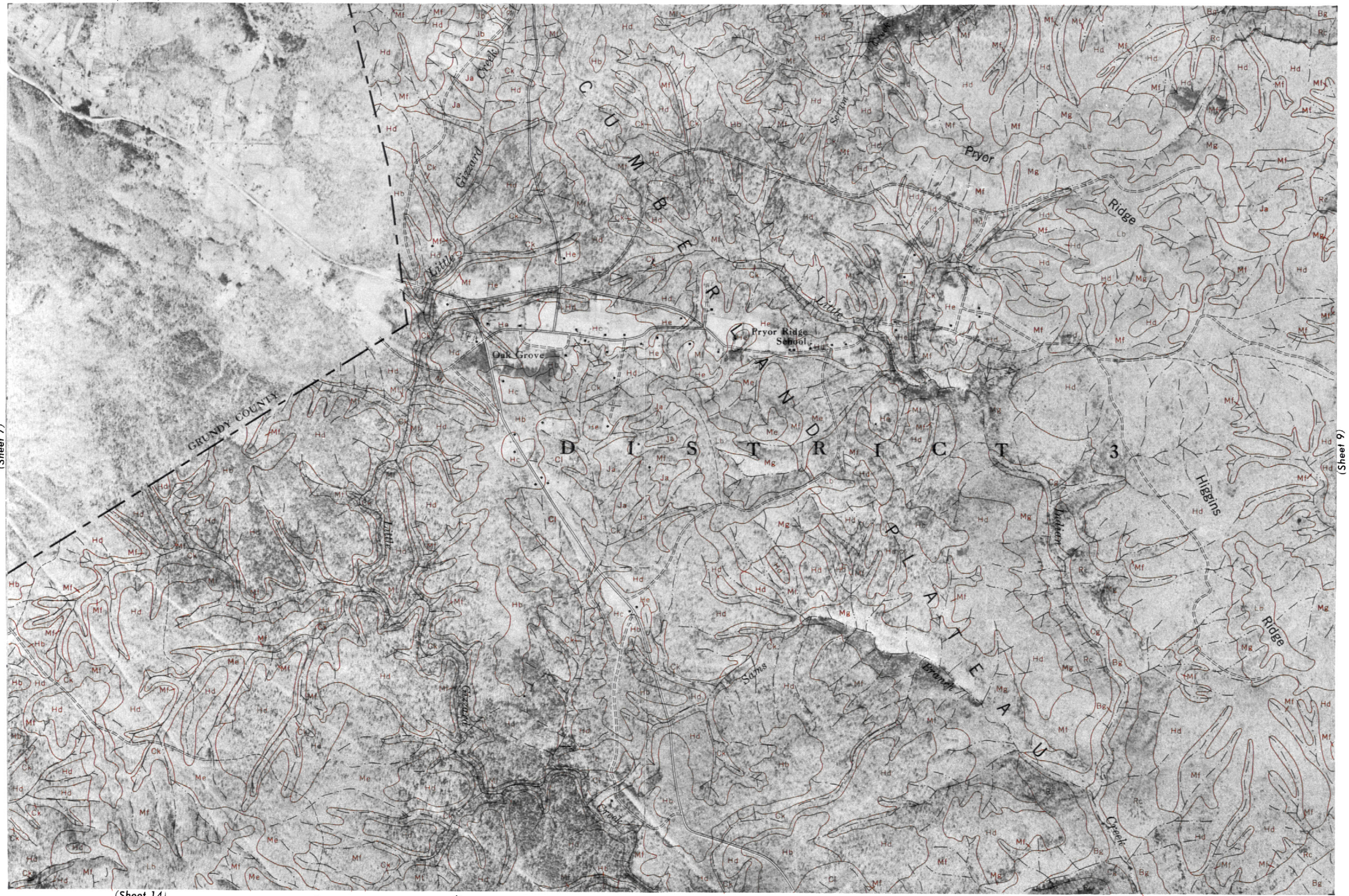
(Sheet 2)

N

(Sheet 7)

(Sheet 9)

(Sheet 14)



0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 8)

(Sheet 10)

(Sheet 15)

N

Butterstack Ridge

BRYANT COVE

Little Peter Cove

Creek

DISTRICT 30

Pine Hill Church

Branch

Johns Branch

PLATEAU

Pine Hill School

The Chimneys

SEQUATCHIE COVE

Gray's Point

Bee

Miller

Knight

Creek

THE POCKET

CUMBERLAND

Low Gap Road

Pocket

Distribute

Branch

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(10)

(Sheet 4)

Mg

N

(Sheet 9)

(Sheet 11)

Wb

(Sheet 16)

Presnell Cemetery

THE POCKET

Kerr Branch

Coon Branch

Coon Creek Bridge

Second Branch

Rock Creek

Star Gap

Cedar Spring School

Reed Cove

Daniel Creek

ST LOUIS AND SAN FRANCISCO RAILWAY

Shirleyron

Red Hill

Price Cemetery

CHATTANOOGA

NASHVILLE

SEQUATCHIE RIVER

SEQUATCHIE VALLEY

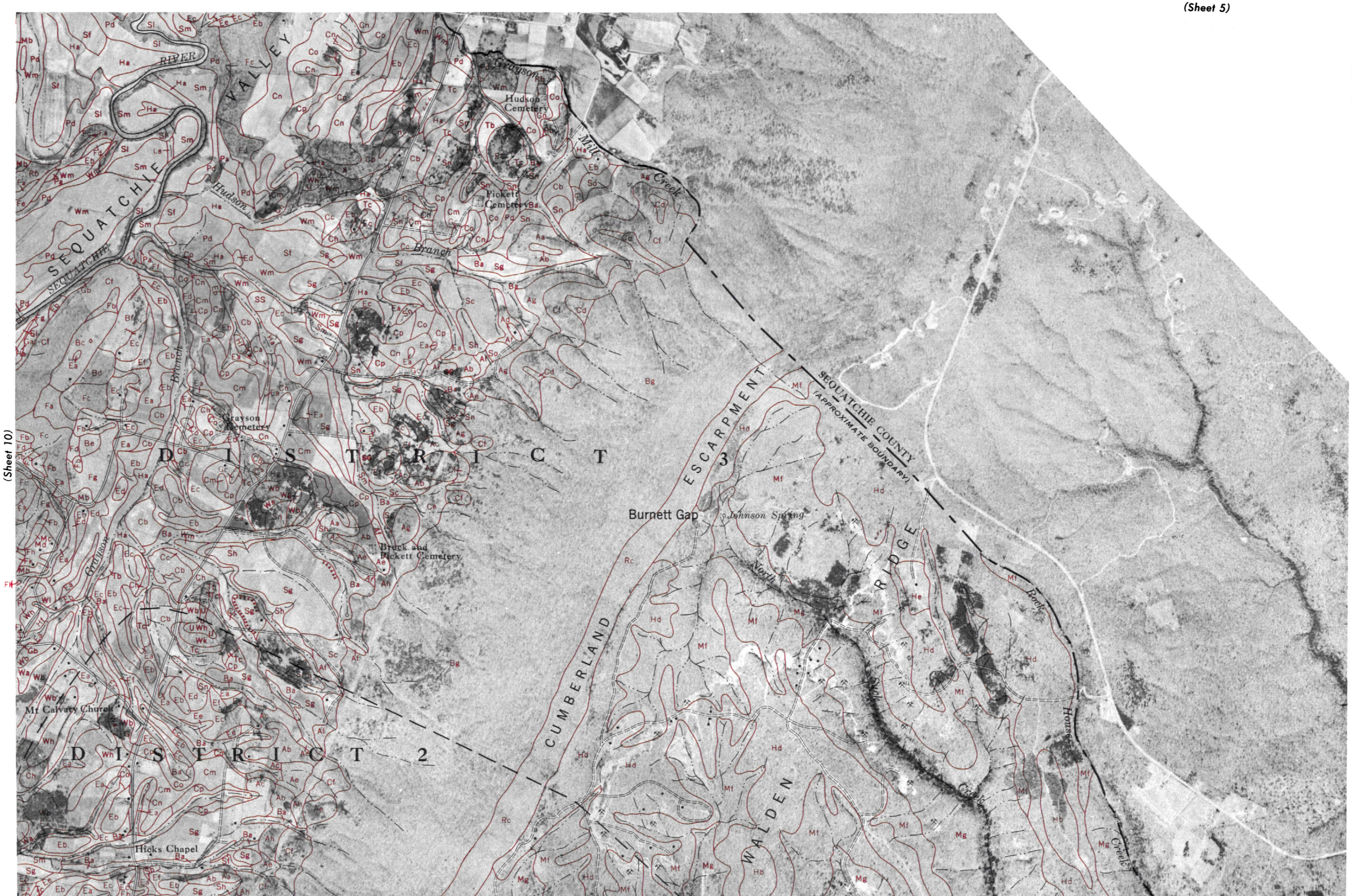
CUMBERLAND PLATEAU DISTRICT 3

DIST 2

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet



(Sheet 10)

(Sheet 17)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

12

(Sheet 6)

N

Midway

Harrison Cemetery

Dripping Spring Cove

Deny Cove

Bear Creek

Fourth Branch

PLATEAU

DISTRICT 5

DISTRICT 1

Kirby-Smith Point

West Fork Bethel Cove Creek

Battle

LADD COVE Creek

St Johns Church

Raven Den Point

CUMBERLAND

FRANKLIN COUNTY

(Sheet 13)

(Sheet 18)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 7)

(Sheet 12)

(Sheet 14)

(Sheet 19)

N

DISTRICT 5

DISTRICT 3

DISTRICT 1

COVE

GIZZARD

Bell Branch

Little Cove

FIERY GIZZARD CREEK

Alpine View Point

Pigeon Point

King Cove

Ray Cove

Polly Cove

Battle Creek

41 64

0 ½ 1 Mile

Scale 1:20000

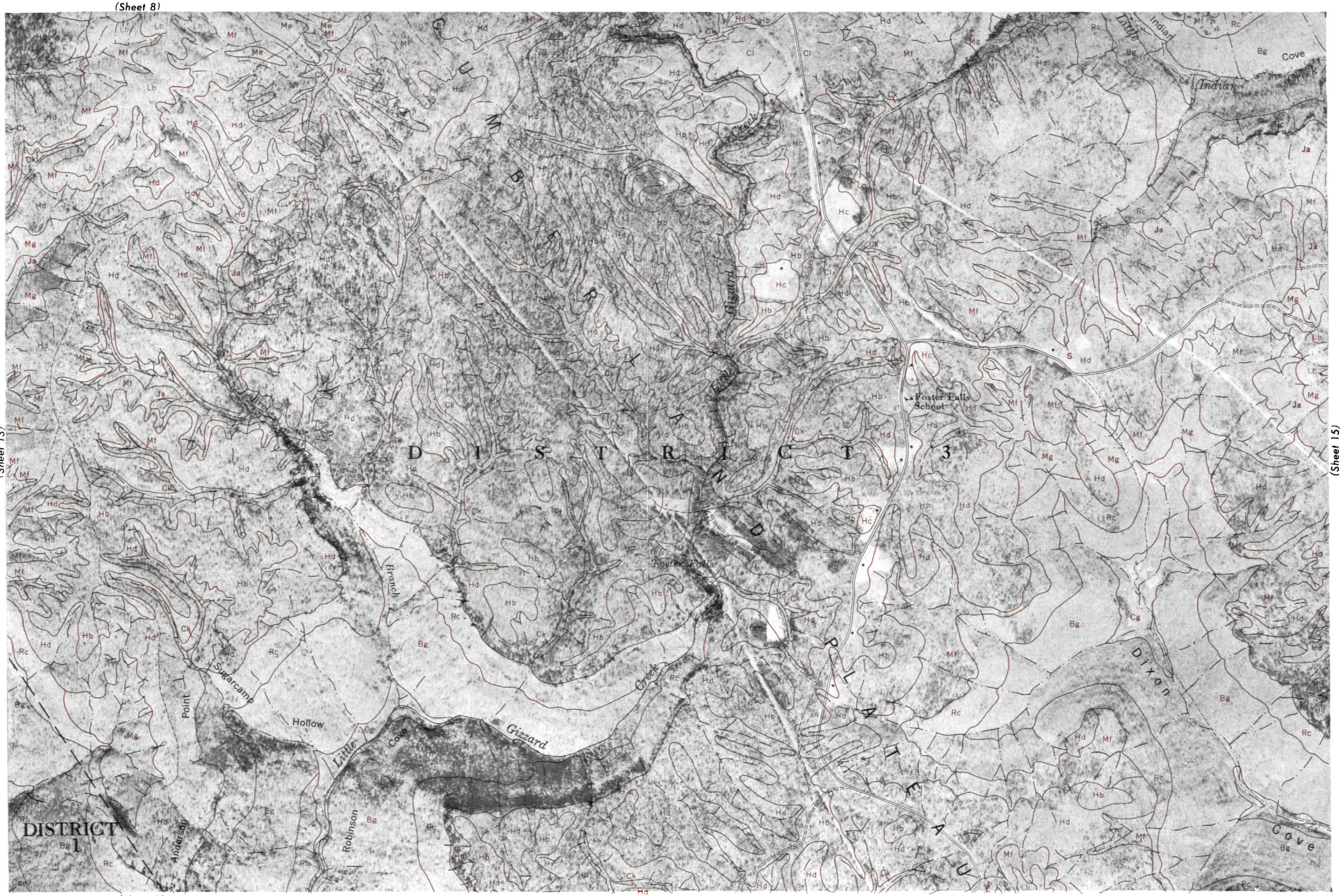
0 5000 Feet

(Sheet 8)

N

(Sheet 13)

(Sheet 15)



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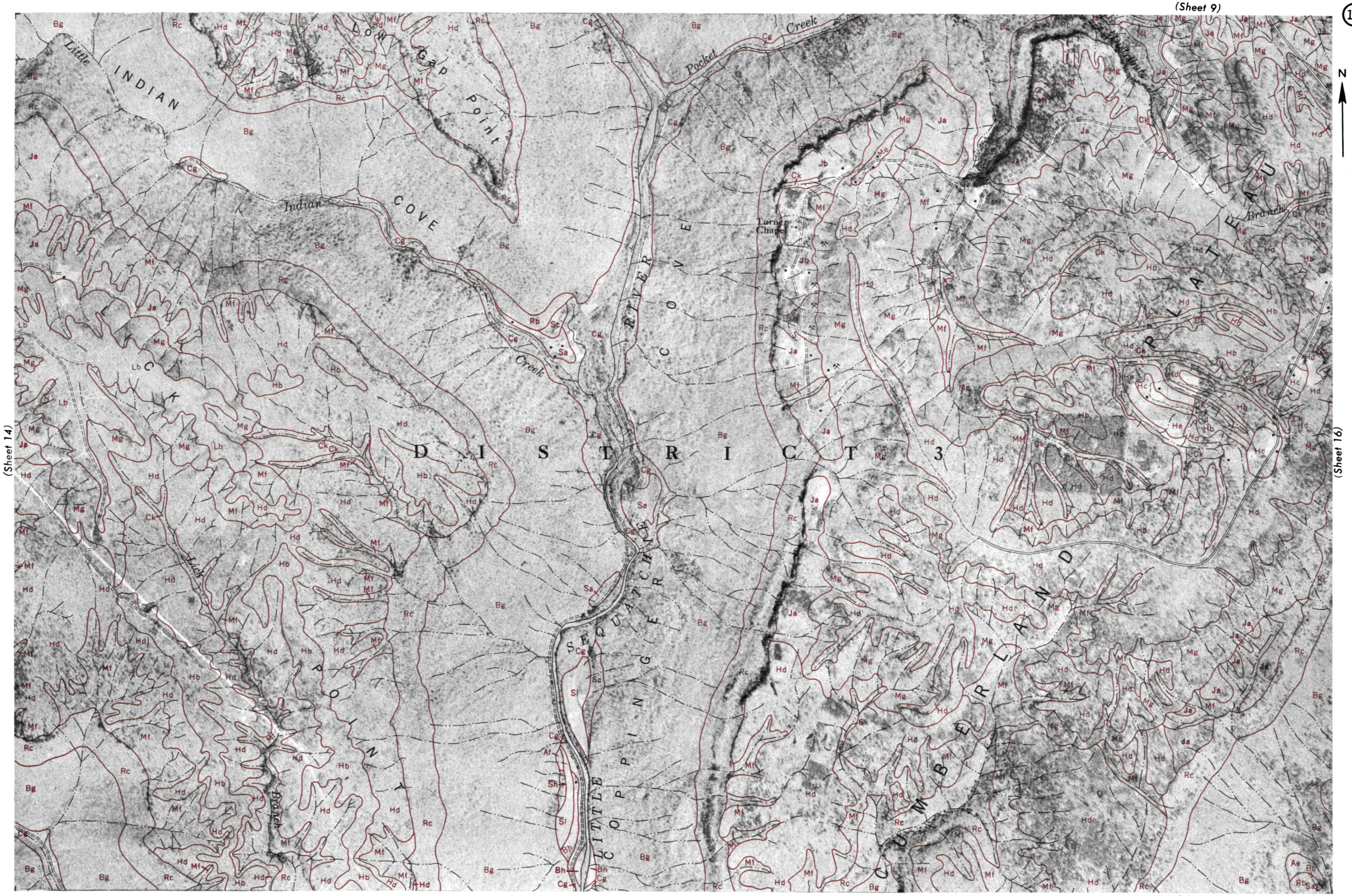
0 ½ 1 Mile Scale 1:20 000 0 5000 Feet



0 ½ 1 Mile Scale 1:20000 0 5000 Feet

16

(Sheet 10)

N

WHITWELL MINE

INCLINE

Walker Cemetery

Mt Olive

English Cove

ST LOUIS AND SAN FRANCISCO

Whitwell

LITTLE RIVER

Looneys Chapel

Looneys

Wm Creek

South Cemetery

Powells Crossroads

Kelley Chapel

DISTRICT 3

DISTRICT 2

Pryor Cemetery

CHATTANOOGA

SEQUATCHIE

NASHVILLE

Davis Cemetery

(Sheet 15)

(Sheet 17)

(Sheet 22)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 11)

N

(Sheet 16)

Teague Cemetery

Looneys Cr

Ketner Gap

ESCARPMENT

DISTRICT 3

DISTRICT 2

South Creek

North Prong Roble House Creek

SEQUATCHIE COUNTY

Sequatchie Creek

Panther Ridge

Suck Creek School

Suck Branch

Spring Creek

Mullens Creek

Hurricane Creek

CUMBERLAND

WALDEN

PRENTICE COOPER STATE FOREST AND GAME MANAGEMENT AREA

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 23)

(18)

(Sheet 12)

N

FRANKLIN COUNTY

CUMBERLAND PLATEAU

DISTRICT 5

DISTRICT 1

Mitchell Cove

Cove

Jumpoff

Jumpoff School

Jumpoff Cemetery

Gaines Cove

Red Hill

DISTRICT

(Sheet 19)

(Sheet 24)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 13)

(Sheet 18)

(Sheet 20)

(Sheet 25)

N

Martin Springs

Martin Springs School

Speegle Point

Peach Orchard Cove

Hargiss Cove

Battle Creek

Gaines Cove

Anderson Cove

Cedar Ridge

Speegle Cove

Gizzard Creek

Comfort

Lous Chapel

Big

41 64

DISTRICT 1

0 1/2 1 Mile

Scale 1:20 000

0 5000 Feet

(20)

(Sheet 14)

N

(Sheet 19)

(Sheet 21)

(Sheet 26)

Big Fiery Gizzard Creek

Robinson Cove

Little Gizzard

Ellidge Point

Denny Cove

Lick Hollow

Cove Creek

Gizzard

CUMBERLAND DISTRICT 1

CUMBERLAND DISTRICT 3

Big Ridge

Sawmill Creek

Pryor North Fork

Pryor Cove

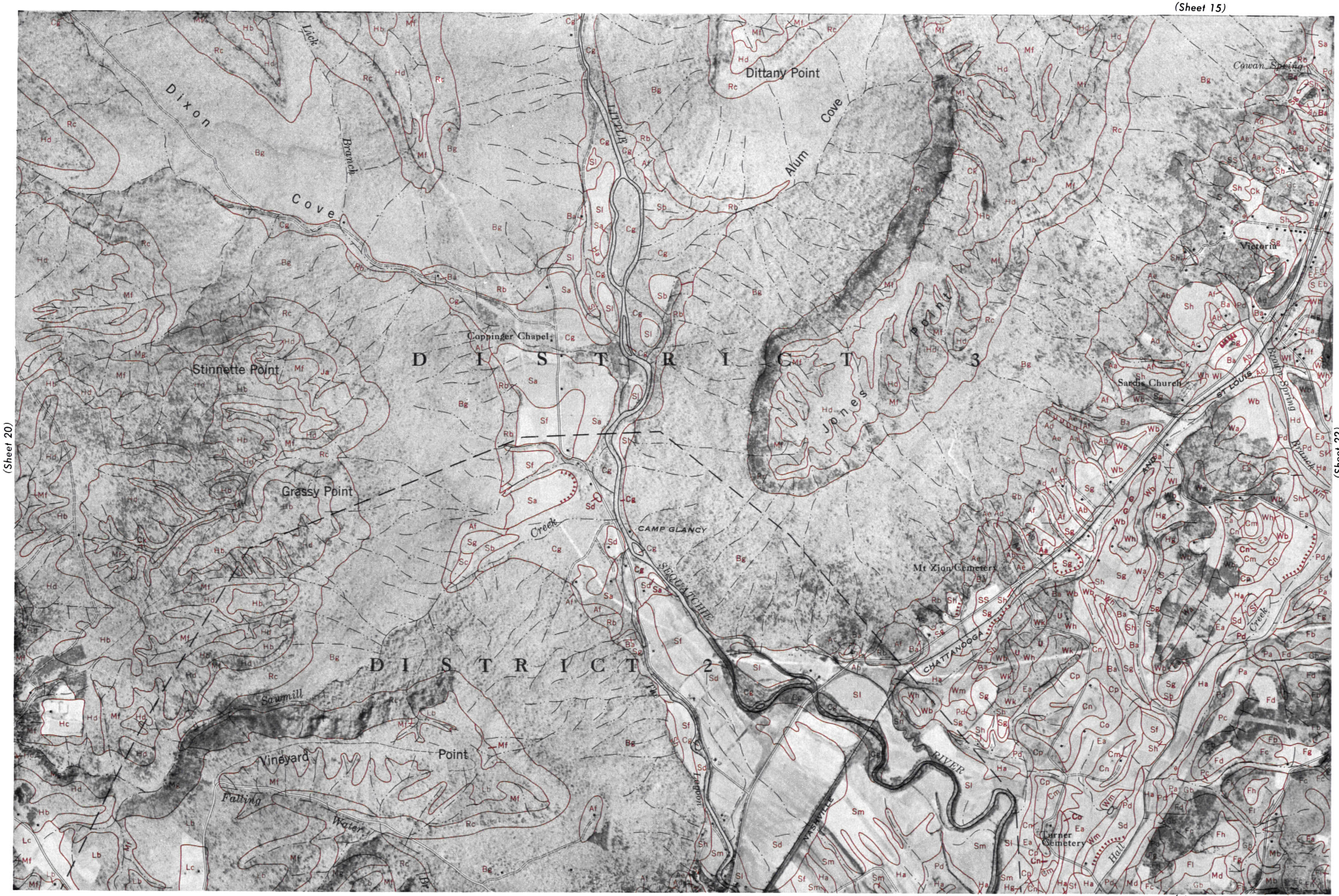
Cove Branch

PLATEAU

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

22

(Sheet 16)

Cn

N

Layne Cemetery

Pilgrims Rest Church

Coulon Spring Branch

Layne Chapel

Fairview Church

Walden Cemetery

SEQUATCHIE RIVER VALLEY

Sulphur Springs School

Creek

Davis Lake

Shelton

Shelton Cemetery

Ditch Gap

ST FOR BDY

DIST 2

DISTRICT 3

ESCARPMENT

CUMBERLAND

Ketner Mill

Oak Grove

Shelton Branch

Dry Creek

DISTRICT 2

PRENTICE COOPER STATE FOREST AND GAME MANAGEMENT AREA

(Sheet 21)

(Sheet 23)

(Sheet 28)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 17)

(Sheet 22)

(Sheet 29)

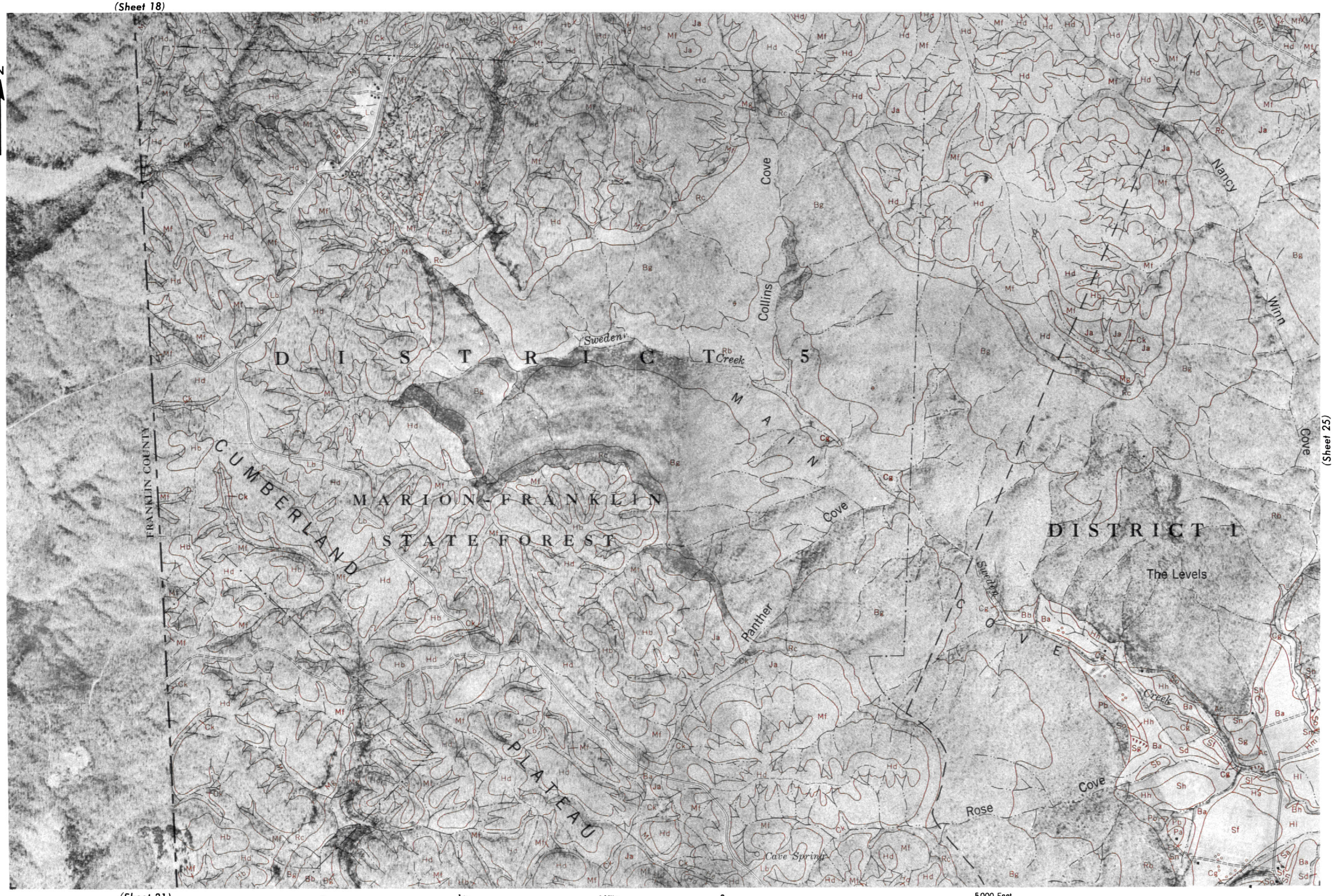
Scale 1:20 000

0 ½ 1 Mile

0 5000 Feet

(Sheet 18)

N



(Sheet 25)

(Sheet 31)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Sheet 19)

25

N

(Sheet 24)

(Sheet 26)

Snake Pond
Tate Cove
Cedar Ridge
Battle Creek
Battle Creek Institute
Bible Spring
Fiery Gizzard Creek
Gizzard Cove
Gilliam Spring
Gilliam Cove
Gilliam Cemetery
Brice Ridge
Jackson Point
DISTRICT 1
Ballard Cove
Beene Cove
Rogers Cove
Fishtrap Point
Swedens Creek
Beene Cemetery
Battle Creek
Smithtown
Ebenezer Church
Kelly Cove

0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

(Sheet 32)

(Sheet 20)

N

(Sheet 25)

(Sheet 27)

(Sheet 33)

PLATEAU

CUMBERLAND

DISTRICT 1

DISTRICT 2

DISTRICT 3

Middle Point

West Fork

North Fork

Pryor Cove Branch

Pryor Branch Cove

Kelly Cove

Fullerton Bluff

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 21)

27

N

DIST 3

CUMBERLAND PLATEAU

DISTRICT 3

DISTRICT 2

Falling Water Cr.

Sequatchie

SPRING HILL

OWENS

LITTLE SEQUATCHIE

Hall Creek

ST LOUIS AND

Castle Rock Point

Clear Spring

Laster Cemetery

Spring Branch

Bg

North Fork

W Fork Pryor Creek

Sa

Sd

Branch

Pine Grove Cemetery

CHATTANOOGA

Nicketown

Spangler Cemetery

SEQUATCHIE VALLEY

SEQUATCHIE RIVER

Sheninger Branch

Blue Spring

JASPER

NASHVILLE

Jasper School

MARION COUNTY HOME

Ebenezer Church

(Sheet 26)

(Sheet 28)

(Sheet 34)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 22)

N

DISTRICT 3

Caroline Chapel

Knox School

SEQUATCHIE VALLEY

SEQUATCHIE RIVER

Inman

Powder Mill Hollow

ESCARPMENT

CUMBERLAND

Inman Point

PRENTICE COOPER STATE FOREST

WALDEN RIDGE

AND GAME MANAGEMENT AREA

Peck

Long Cemetery

Branch

Mineral Springs

DISTRICT 2

Moore Creek

Shingle Mill Hollow

Hollow

Bennett Hollow

Pryor Cemetery

Oates Cemetery

Mullens Cove

Bennett Lake

TENNESSEE RIVER

HALES BAR LAKE

Pryors Island

DISTRICT 4

(Sheet 27)

(Sheet 29)

(Sheet 35)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 23)

N

(Sheet 28)

(Sheet 30)

DISTRICT 2

PRENTICE COOPER STATE FOREST AND GAME MANAGEMENT AREA

DISTRICT 4

RAGGOON MOUNTAIN

RIDGE

TENNESSEE RIVER

HALES BAR LAKE

Stanley School

Francis Cemetery

Pot Cem

Pot Point

Mullens Cove

Smith

Butcher Creek

Creek

Creek

Mullens Creek

Ransom Hollow

Hollow

Hollow

Ritchie Branch

Muddy Branch

Blowing Springs Branch

Chestnut Bridge Hollow

FOREST BOUNDARY

HAMILTON COUNTY

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 36)

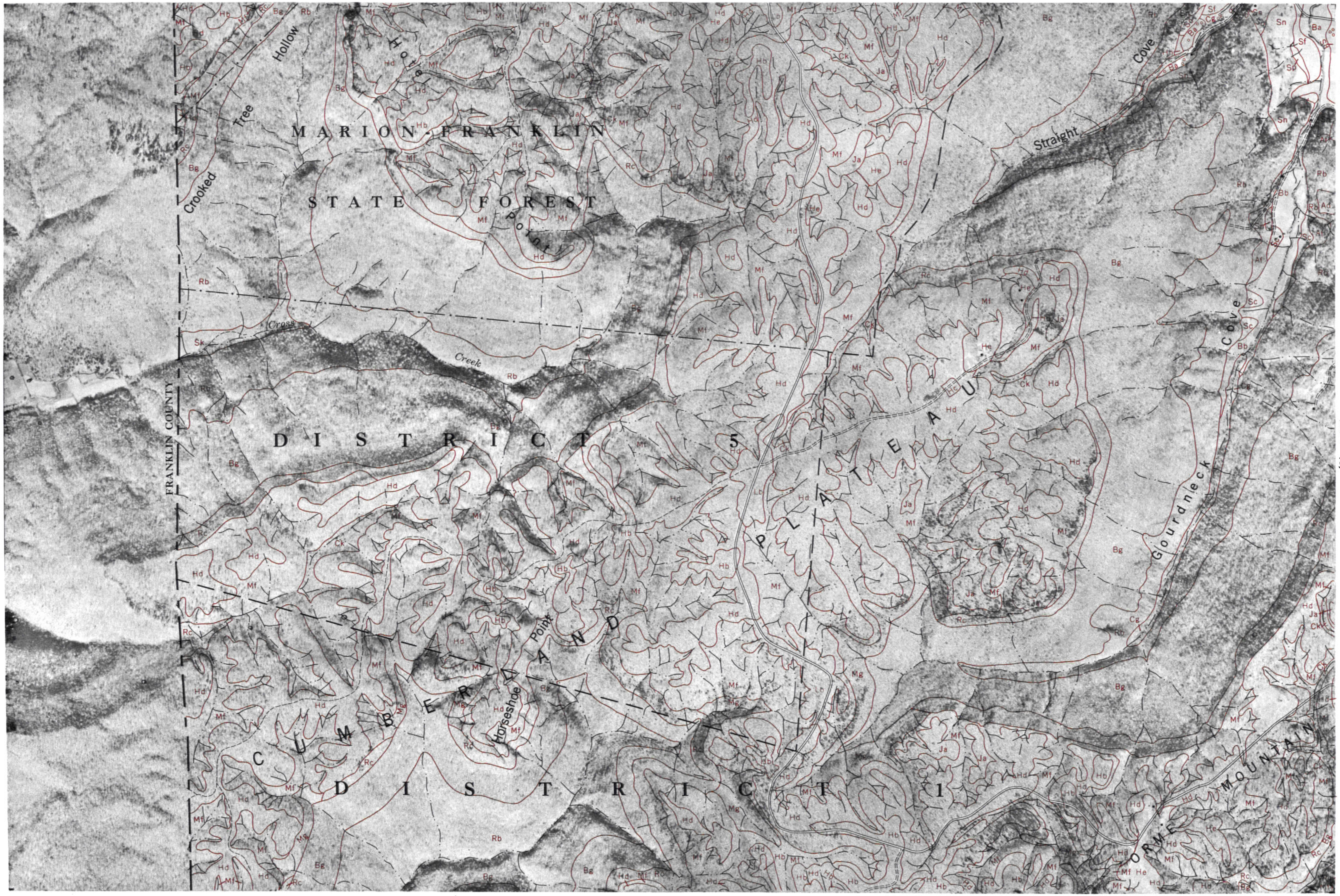
30

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Sheet 24)



(Sheet 32)

(Sheet 38)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Sheet 25)

32

N

Lodge

Sweden Cove School

SWEDEN MOUNTAIN

HONEYCUTT CAVE

Point

Bolton

Gilliam

Cove

SWEDEN COVE CREEK

BATTLE CREEK

CUMBERLAND PLATEAU DISTRICT 1

Kelley Cove

Huse Cove

Orme Mountain School

Deerstand Hill

Patton School

(Sheet 31)

(Sheet 33)

(Sheet 39)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 26)

N

Roberts Point

Bluff

Drain Spring

DISTRICT 2

Glover Hill

Kimball Point

Raulston Cemetery

DISTRICT 1

King Point

Kimball

BATTLE CREEK

Dixie Lee

Cumberland View Cemetery

King Spring

Nightower Spring

CHATTANOOGA AND ST LOUIS

NASHVILLE

TENNESSEE RIVER

Burns Island

GUNTERSVILLE LAKE

(Sheet 32)

(Sheet 34)

(Sheet 40)

0 ½ 1 Mile

Scale 1:20000

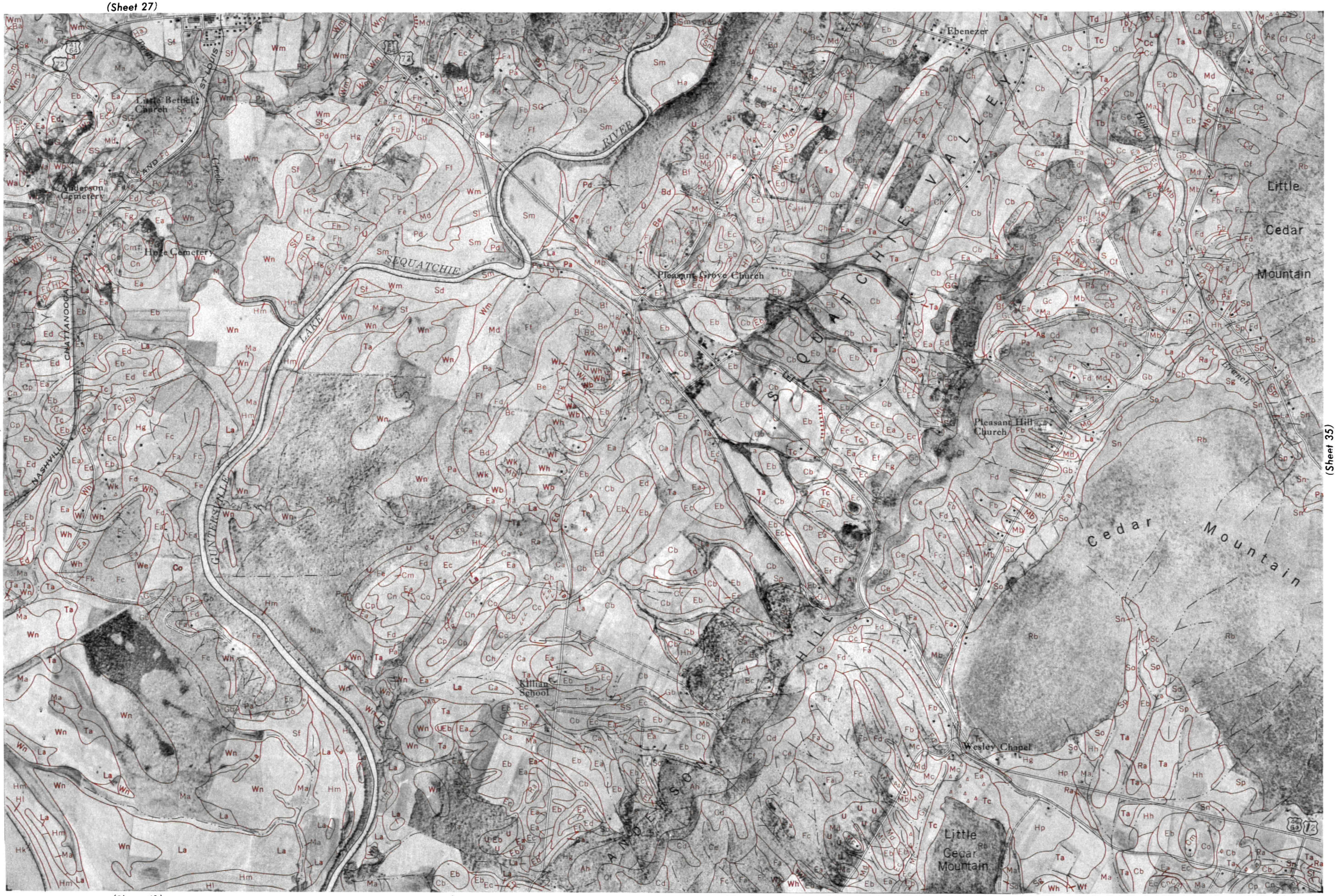
0 5000 Feet

MARION COUNTY, TENNESSEE

34

(Sheet 27)

(Sheet 33)

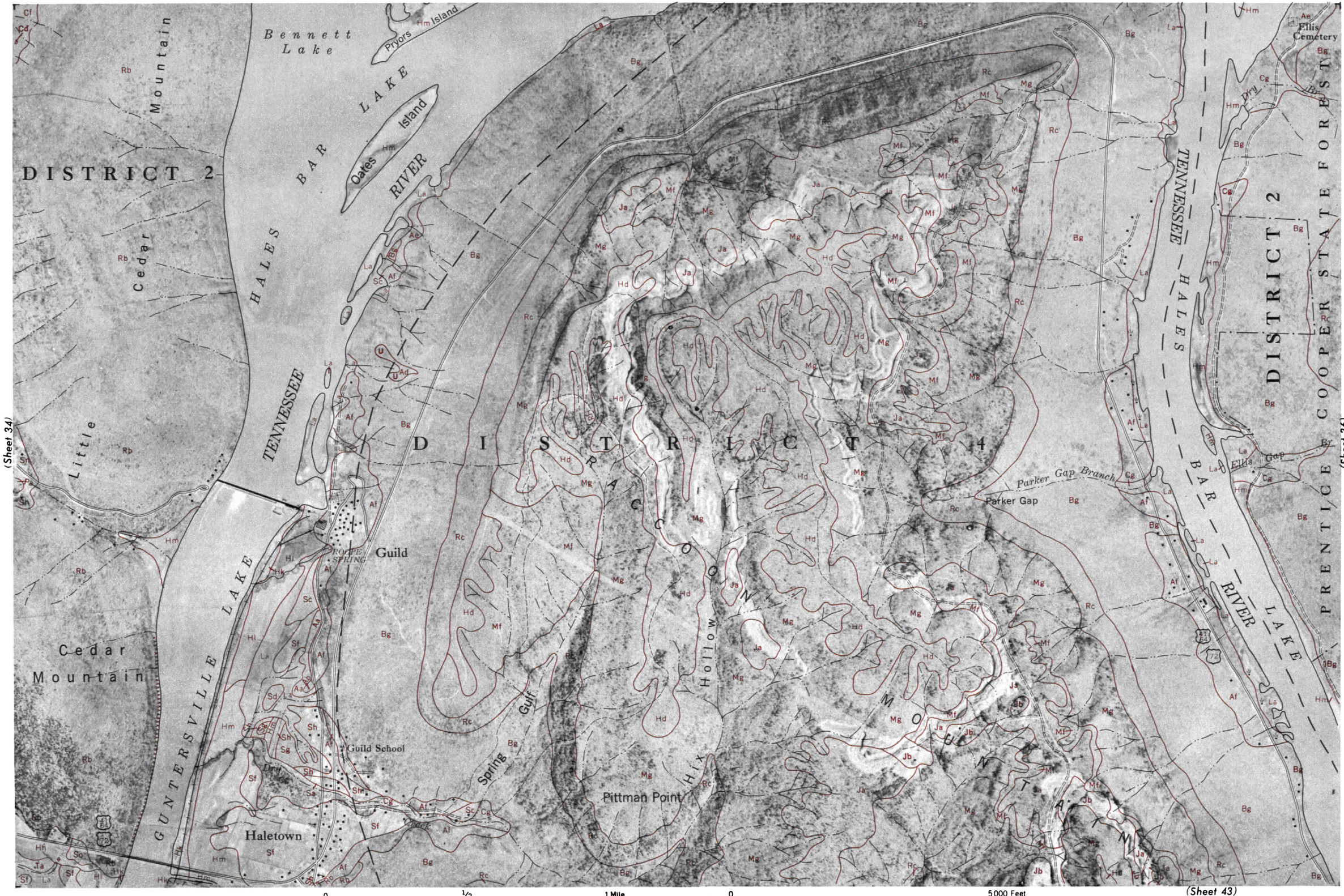


(Sheet 35)

(Sheet 41)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Sheet 28)


N
DISTRICT 2
DISTRICT 4
DISTRICT 2
Bennett Lake
Pryors Island
Oates Island
HALES BAR LAKE
TENNESSEE RIVER
HALES BAR LAKE
TENNESSEE RIVER
PRENTICE COOPER STATE FOREST
Cedar Mountain
Little Cedar Mountain
GUNTERSVILLE LAKE
Guild
ROPER SPRING
Guild School
Haletown
Spring Gulf
Pittman Point
Hix Hollow
MOUNTAIN
Parker Gap
Parker Gap Branch
Ellis Cemetery
Ellis Gap
Creek
Dry
(Sheet 34)
(Sheet 36)
(Sheet 43)
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

(Sheet 29)

N

(Sheet 35)

(Sheet 37)

(Sheet 43)

Massengale Point

WALDEN RIDGE

DISTRICT 2

PRENTICE COOPER

STATE FOREST

AND GAME MANAGEMENT

AREA

DISTRICT 4

RACCOON MOUNTAIN

Bill McNabb Gulf

Dry Branch

Hogpen Branch

McNabb Cemetery

Alex McNabb Branch

Hicks Gap

Ellis Gap

Ellis Gap Branch

Ellis Branch

TENNESSEE RIVER

John Grindstone Ridge

McNabb Branch

McNabb School

Laurel Branch

Brown Gulf

Hicks Mountain BOUNDARY

FOREST

Kellys Ferry

Ellis Cemetery

HALES BAR LAKE

Cummings Lake

Huff Branch

Cummings Church

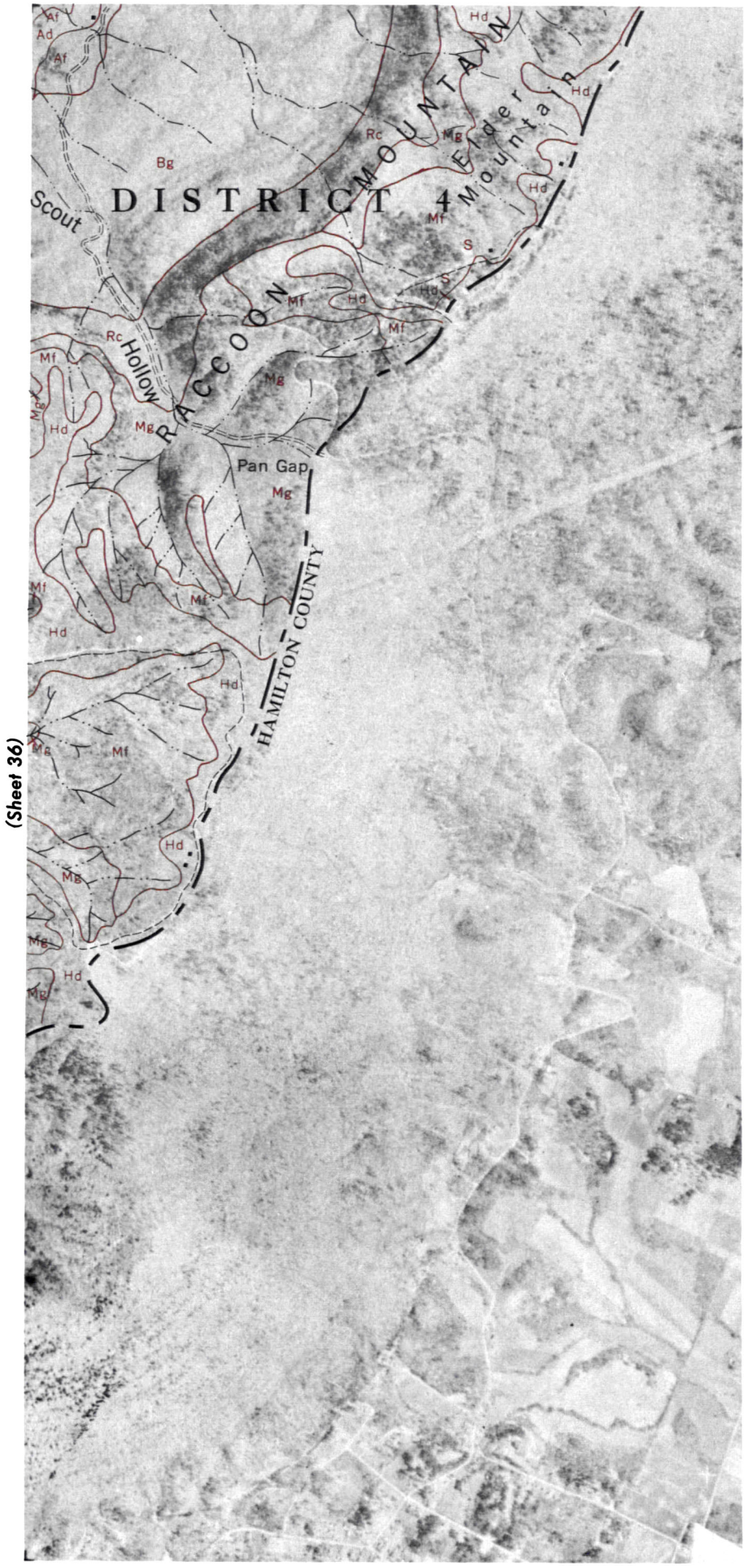
HAMILTON COUNTY

GRANT CAVE

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet



(Sheet 36)

N

0 1/2 1 Mile

Scale 1:20 000

0 5000 Feet

38

(Sheet 31)

N

Falling Cliff

Flat Cove

Holly

The Cowbones

Payne Cove

Camp Branch

Clayton

Otmc

Turnpike

Point

(Sheet 39)

FRANKLIN COUNTY

STAIRS

WINDING

D I S T R I C T 1

CUMBERLAND PLATEAU

Wildman

Cove

Creek

Cluck

Gourdneck

Hollow

Tar Kiln Point

Cove

Dry

JACKSON COUNTY

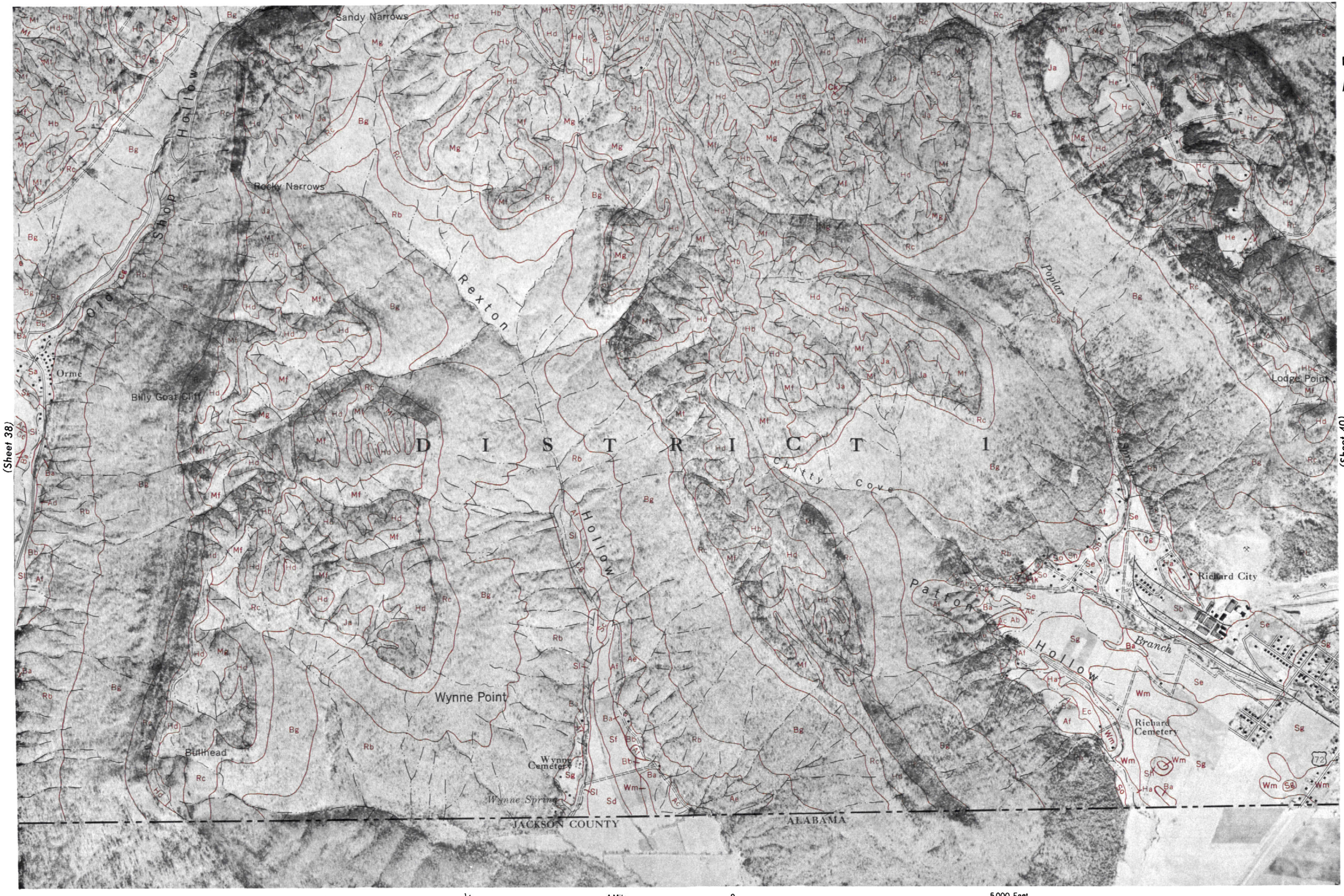
ALABAMA

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 32)


N
Sandy Narrows
Rocky Narrows
Old Shop Hollow
Rexton
Poplar
Orme
Billy Goat Cliff
Lodge Point
D I S T R I C T 1
Chitty Cove
Wynne Point
Bullhead
Wynne Cemetery
Wynne Spring
JACKSON COUNTY
ALABAMA
Richard City
Patton Hollow
Branch
Richard Cemetery
(Sheet 38)
(Sheet 40)
0 ½ 1 Mile
Scale 1:20000
0 5000 Feet

(40)

(Sheet 33)

N

(Sheet 39)

(Sheet 41)

Whitacre Point

Happy Hollow

Raulstontown

South Pittsburg

Hamburg

Richard City

Spring

Poplar

Boundary

NASHVILLE AND CHATTANOOGA

72

GUNTERSVILLE LAKE

BATTLE CREEK

Burns Island

TENNESSEE RIVER

DISTRICT 1

McDaniel Annex Church

Blevins Hollow

Ford Cemetery

Antioch Church

New Hope School

New Hope Cemetery

Moore Crossing

ST LOUIS AND CHATTANOOGA

NASHVILLE

Long Island

JACKSON COUNTY

ALABAMA

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

(Sheet 34)

N

(Sheet 40)

(Sheet 42)

SEQUATCHIE RIVER

Wyrick Cemetery

ANDERSON HILL

Little Cedar Mountain

Rankin Cove

Haveron Chapel

TENNESSEE RIVER

DISTRICT 2

Grays Bluff

LAKE GUNTERSVILLE

ST LOUIS AND CHATTANOOGA

Graham Cove

Graham Branch Cove

NASHVILLE

Shellmound Station

Nickajack Creek

Cole Creek

Shellmound

McDaniel Chapel

DISTRICT 1

NICKAJACK CAVE

Burnett Chapel

Burnett Point

Hogjaw Creek

State Line Cemetery

JACKSON COUNTY

ALABAMA

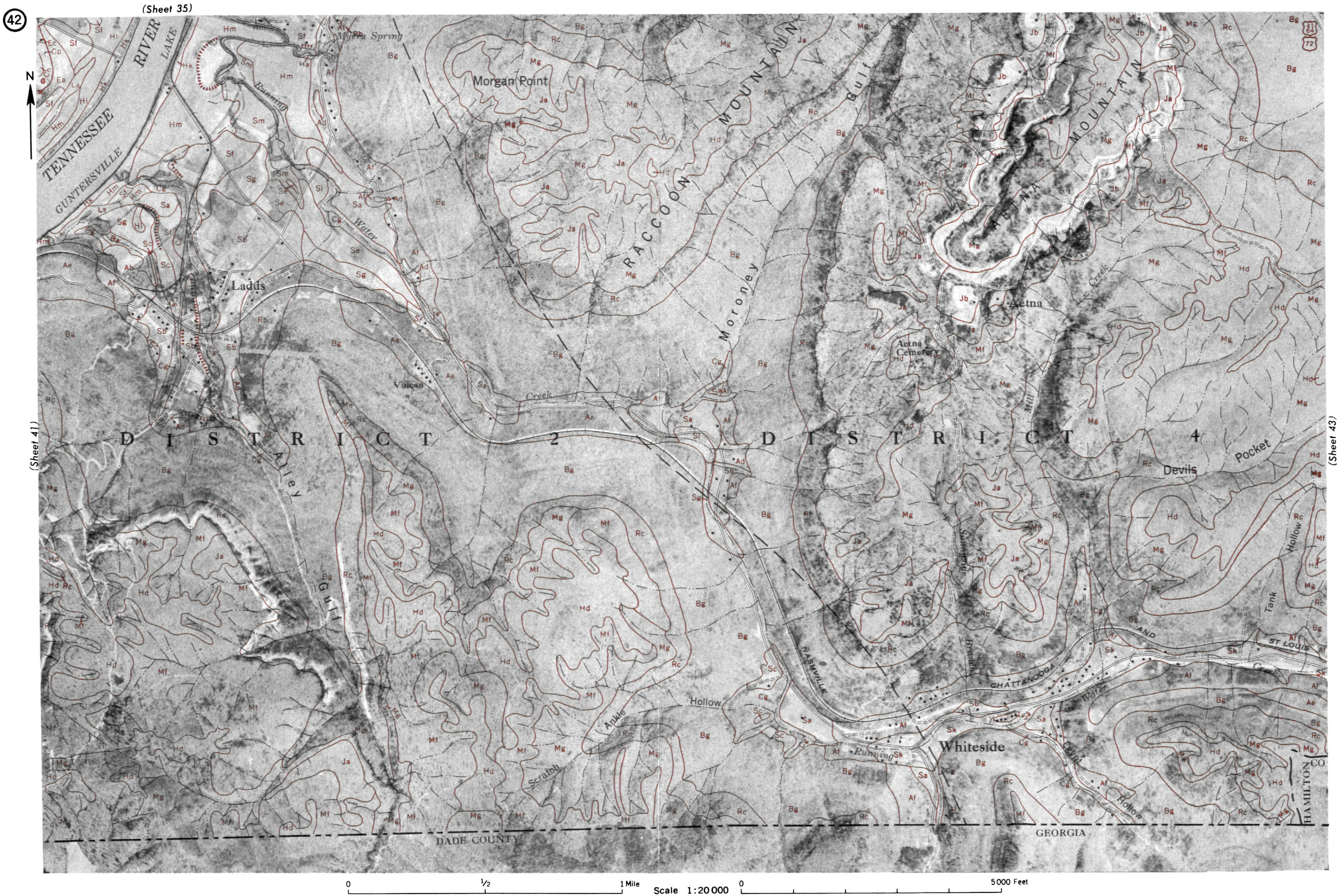
DADE COUNTY

GEORGIA

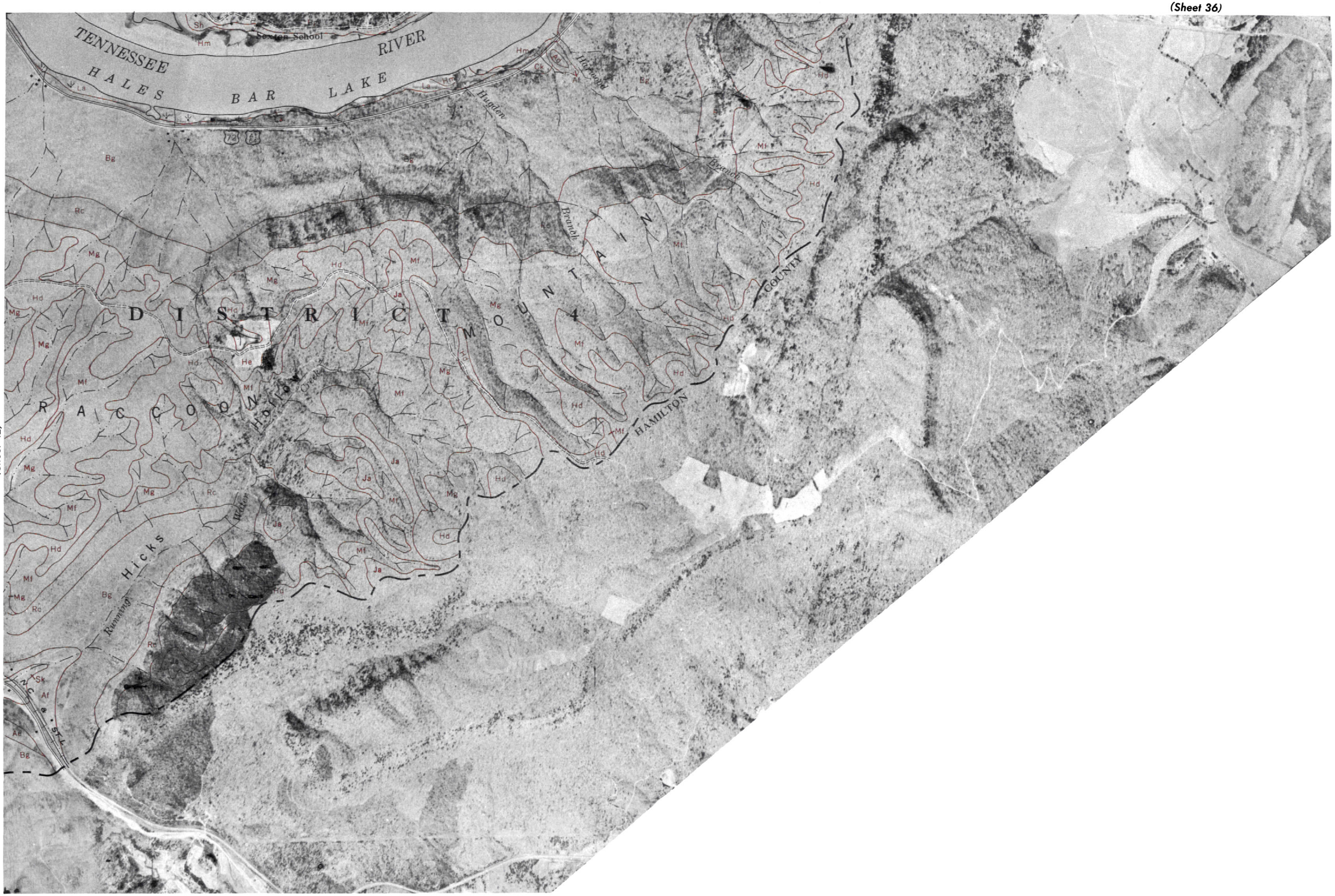
0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

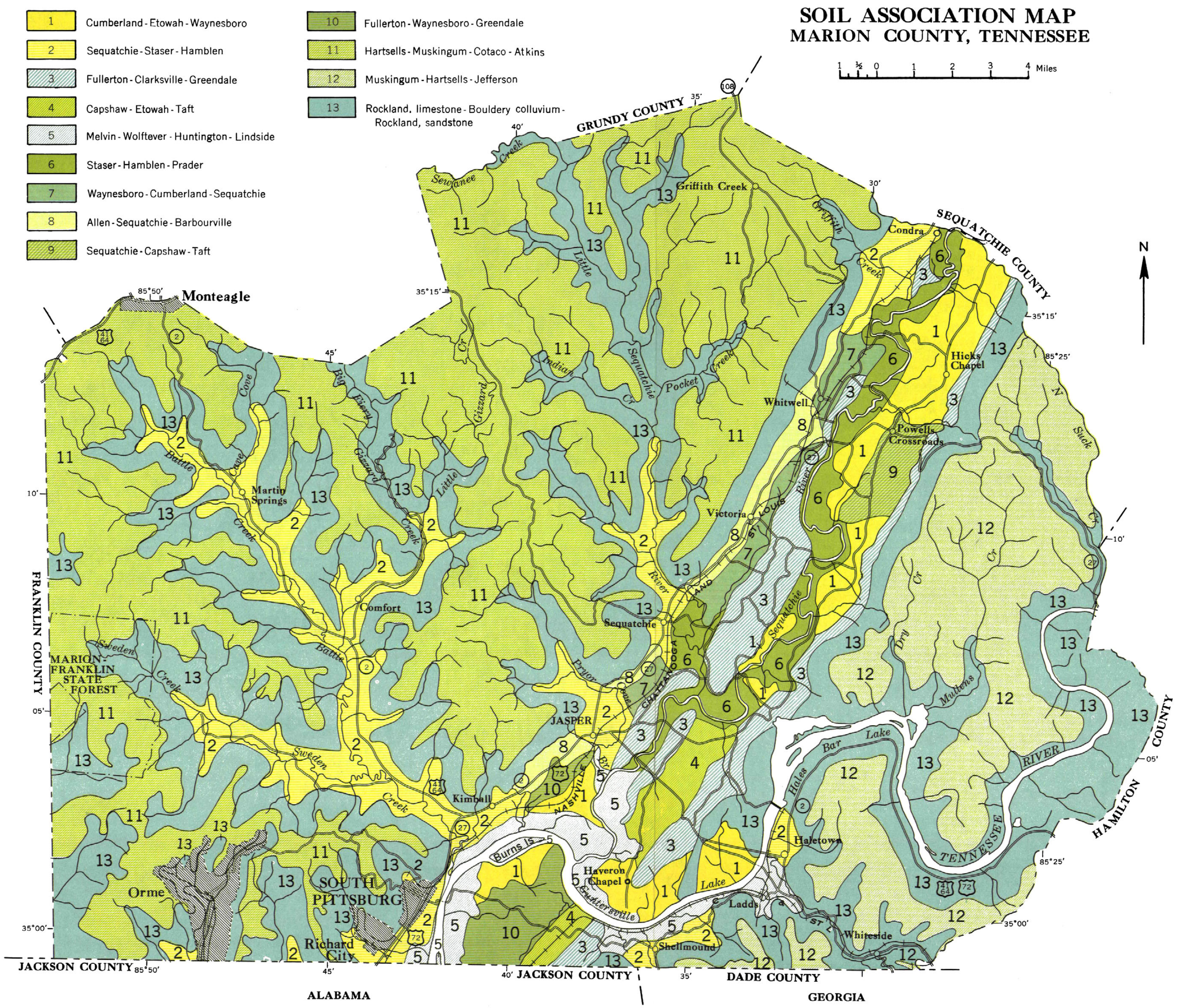

42
(Sheet 35)
(Sheet 41)
(Sheet 43)
N
TENNESSEE
RIVER
GUNTERSVILLE
LAKE
Myers Spring
Running
Water
Morgan Point
RACCOON
MOUNTAIN
Gulf
Moroney
AETNA
MOUNTAIN
Aetna
Aetna Cemetery
Ladds
Volcan
Creek
Mill
Creek
DISTRICT 2
DISTRICT 4
Devils
Pocket
Alley
Gulf
Hollow
Ankle
Scratch
Hollow
Tank
NASHVILLE
CHATTANOOGA
AND
ST LOUIS
Whiteside
Running
Water
Hollow
HAMILTON CO
DADE COUNTY
GEORGIA
0
1/2
1 Mile
Scale 1:20000
0
5000 Feet

(Sheet 36)



(Sheet 42)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet


SOIL ASSOCIATION MAP
MARION COUNTY, TENNESSEE
1 Cumberland - Etowah - Waynesboro
2 Sequatchie - Staser - Hamblen
3 Fullerton - Clarksville - Greendale
4 Capshaw - Etowah - Taft
5 Melvin - Wolftever - Huntington - Lindside
6 Staser - Hamblen - Prader
7 Waynesboro - Cumberland - Sequatchie
8 Allen - Sequatchie - Barbourville
9 Sequatchie - Capshaw - Taft
10 Fullerton - Waynesboro - Greendale
11 Hartsells - Muskingum - Cotaco - Atkins
12 Muskingum - Hartsells - Jefferson
13 Rockland, limestone - Bouldery colluvium - Rockland, sandstone
Miles
N
GRUNDY COUNTY
SEQUATCHIE COUNTY
FRANKLIN COUNTY
HAMILTON COUNTY
JACKSON COUNTY
DADE COUNTY
ALABAMA
GEORGIA
Monteagle
MARION - FRANKLIN STATE FOREST
Martin Springs
Comfort
Griffith Creek
Condra
Whitwell
Victoria
Sequatchie
Hicks Chapel
Powells Crossroads
JASPER
Kimball
SOUTH PITTSBURG
Richard City
Orme
Haletown
Haveron Chapel
Ladds
Shellmound
Whiteside
TENNESSEE RIVER
Hales Bar Lake
Burns Is.
Sequatchie River
Battle Creek
Sweden Creek
Little Sequatchie
Pocket Creek
Indian Cr
Gizzard Cr
Big Fiery Gizzard
Sewanee Creek
Dry Cr
Mullens Cr
N Suck Cr
Pryor Cove
Cove
Guntersville Lake
Nickajack
CHATTANOOGA
NASHVILLE
ST LOUIS